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# CANADIAN MINING JOURNAL

VOL. XXXVIII

TORONTO

No. 1



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### MINES BRANCH

#### Recent Publications

- The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.
- Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.
- Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-pating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
- Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.
- Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

**Fuel Testing Laboratory.**—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

**Ore-Dressing Laboratory.**—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

**Chemical Laboratory.**—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

**Ceramic Laboratory.**—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

**Structural Materials Laboratory.**—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

### GEOLOGICAL SURVEY

#### Recent Publications

- Summary Report of the Geological Survey for the Calendar Year 1915.
- Memoir 34. The Devonian of Southwestern Ontario, by Clinton R. Stauffer.
- Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.
- Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.
- Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.
- Memoir 66. Clay and Shale Deposits of the Western Provinces (Part 5), by J. Keele.
- Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.
- Memoir 73. The Pleistocene and Recent Deposits of the Island of Montreal, by J. Stansfield.
- Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.
- Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.
- Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.
- Memoir 78. Wabana Iron Ore of Newfoundland, by A. O. Hayes.
- Memoir 81. The Oil and Gas Fields of Ontario and Quebec, by W. Malcolm.
- Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.
- Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.
- Map 59A. Wheaton, Yukon Territory.
- Map 150A. Ponhook Lake Sheet, Nova Scotia.
- Map 160A. Manaimo Sheet, Vancouver Island.

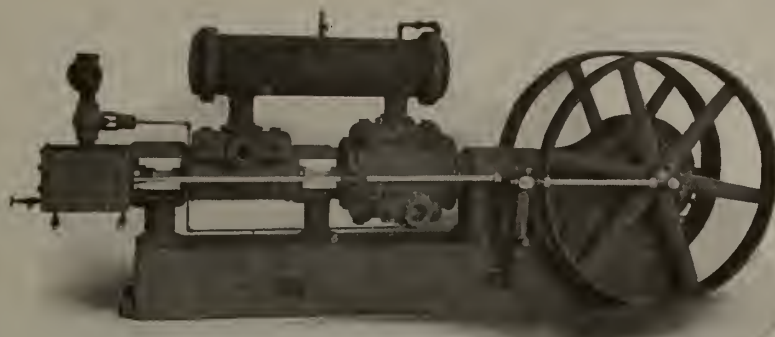
Applicants for publications not listed above should mention the precise area concerning which information is desired.

Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

Communications should be addressed to The Director, Geological Survey, Ottawa.

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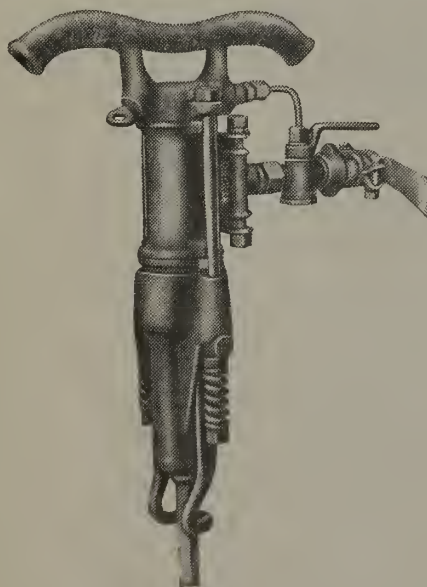
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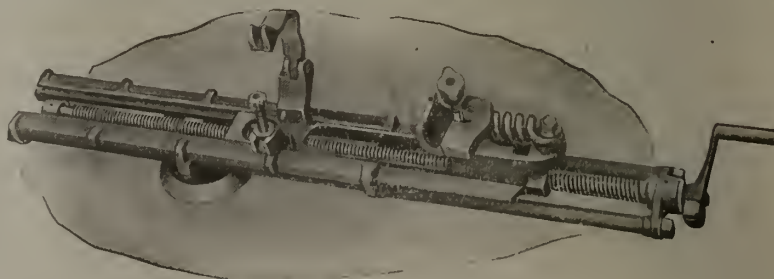
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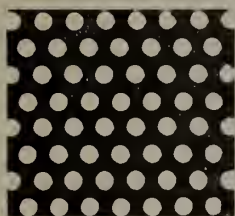
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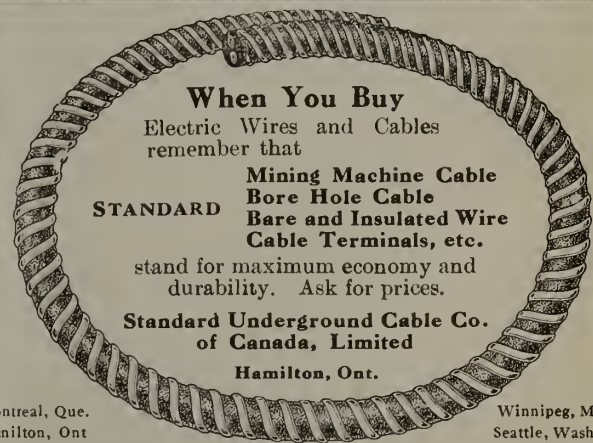
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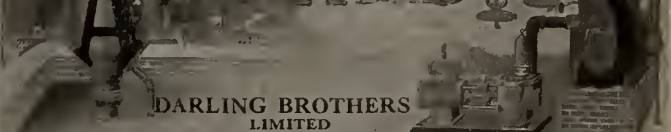
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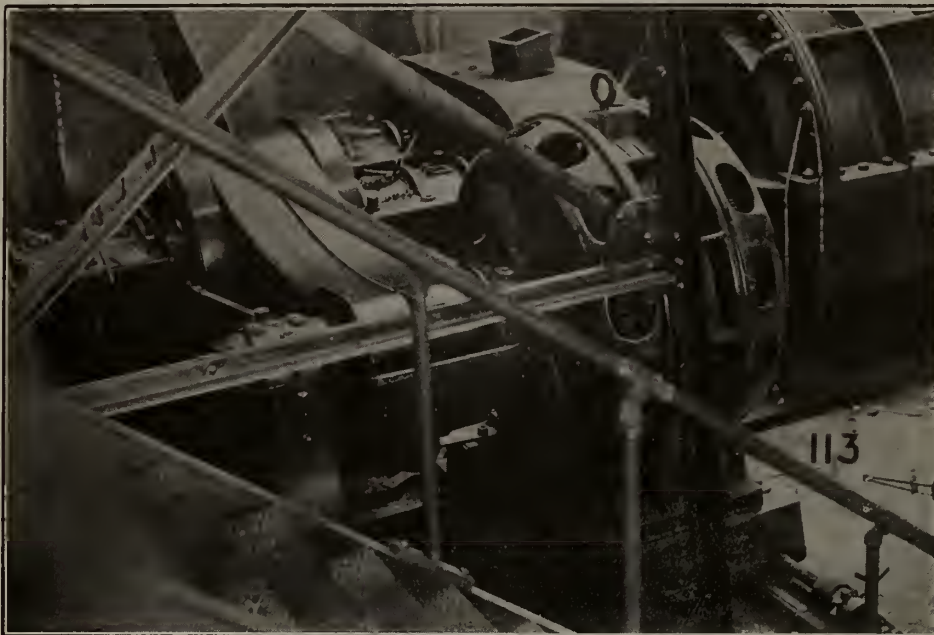
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, January 1, 1917.

No. 1

## The Canadian Mining Journal

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REGINALD E. HORE

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### CIRCULATION

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### SCIENCE AND INDUSTRY

In view of the fact that the Canadian public now looks with favor on proposals to encourage scientific and industrial research, it is probable that the services of scientists will be utilized in our industries to a greater extent than heretofore. That the Dominion Government is alive to the need of more closely linking science and industry is a source of satisfaction. We are also pleased to see that some scientists who have had little to do with the application of science to industry are now convinced that they have been out of touch with those who utilize the results of research. We are also pleased that the general public is awake to the fact that there is need for organization to direct research along useful lines and to make the results readily available.

Sir George Foster, Minister of Trade and Commerce, recognizing the demand for such organization, has appointed an Advisory Council in Industrial and Scientific Research. The announcement was deservedly well received. It appeared that Sir George, who has done much for Canada during the war and who seems to have an unusually clear vision, had taken a step that should help Canada to prepare for the industrial struggle that everyone tells us is to follow the war. A Council composed of properly qualified men would undoubtedly be of great use to our industries.

Our hopes were, however, dashed when we were advised of the personnel of the Council. In their respective spheres these men have attained prominence and we are as ready as anyone to congratulate them on receiving some recognition for their work. We are not convinced, however, that they are the right men for this job. And we cannot help concluding that their appointment has resulted from a lack of appreciation of what the nature of the job is.

In our last issue we commented on these appointments. It has been suggested that we might withhold criticism until the Council has a chance to prove its usefulness. We believe, however, that the matter is too important for such treatment. The mining industry, like other Canadian industries, could be helped by such an organization as the Minister of Trade and Commerce thinks he is furnishing. We are not content to wait for a few years so that he may find out that he has not given what the country needs. We could, after the manner of several of our daily newspapers, dismiss the subject by congratulating Sir George and the men whom he has chosen, and hope for the best. We do not intend to follow such a course, as we do not believe it in the best interest of the mining industry or of other Canadian industries.

That we were warranted in our criticism has been impressed on us by the address of Dr. A. B. Macallum, Chairman of the Council, to the Empire Club in Toronto last week.

Dr. Macallum said, in referring to the appointment of the Council: "It is a new regime when the Government calls in scientific men to advise us." In view of the facts the statement is of course absurd. It might be overlooked if it did not indicate clearly the kind of scientist that has been chosen.

Dr. Macallum shows by this statement that he is not familiar with what has been done or is being done in the field which he is entering. Can we expect such a man to give useful advice as to what should be done? It is no great discredit to Dr. Macallum as a scientist in a special field that he is not familiar with what is being accomplished in some other fields. He has achieved an international reputation in his own subject without devoting attention to what has been done and is being done by scientists, permanently or temporarily in the employ of our Dominion and Provincial Governments. But does his statement convince anyone that he is qualified for the position of Chairman of the Advisory Council?

We cannot agree with Dr. Macallum that the right men have been selected. Referring to the appointment he said: "This new movement is one of the most enlightened things which the Government of Canada has done for a long time." Apparently the light failed before the men were selected.

## ONTARIO'S BIG YEAR

Ontario set a new record in mineral production in 1916. The final figures are of course not yet available; but preliminary estimates show large increase.

Nickel matte produced in the Sudbury district during 1916 contained about 42,000 tons nickel, far exceeding the output of 1915, which was 34,039 tons.

Gold production of Ontario in 1916 amounted to about \$10,000,000 as compared with \$8,501,391 in 1915.

Silver production was less by 2,000,000 ounces than in 1915; but owing to the high prices prevailing the value was greater, amounting to about \$13,500,000 as compared with \$11,742,463 for 1915.

The value of the mineral production of Ontario for 1916 is estimated at about \$65,000,000. That of 1915 was valued at \$57,532,844.

The output of Cobalt silver mines up to the end of 1916 totals about \$136,000,000.

## IRON-ORE MINING.

A large bulletin on iron mining in the United States, work on which has been intermittently progressing for several years, is being completed by D. E. Woodbridge, consulting engineer, and is expected to be ready for publication within a few months.

## TO OPERATE TYEE SMELTER.

Victoria, B.C., Dec. 6.—The Ladysmith smelter, owned and formerly operated by the Tyee Copper Company, an English concern, has been purchased by New York capitalists and as soon as extensions and improvements involving an outlay of \$100,000 can be made the plant will be put in operation. Negotiations for the purchase have been under way for some months, Mr. Gardiner, representative of the Tyee Company having come out from England to complete them. Who are the purchasers or at what figure they acquired the plant is not announced, but it is admitted that they are "big people" in a financial and mining way. This will be their first entrance into the British Columbia field, and hence their acquisition of the property will prove welcome news to those interested in the development of the mining and smelting industry of the island.

For some time past efforts have been made by local organizations interested in the development of Vancouver Island's mineral resources to induce the Government to take steps to bring about the opening of the Ladysmith smelter, and only yesterday a deputation waited upon the Premier and Minister of Mines with that end in view.

The fact that the plant will soon be in full operation again giving employment to over 100 men and, by virtue of its extensions, will be in a position to produce blister copper whereas, when formerly in operation, it could produce only the copper matte, will mean a decided impetus to the industry on this Island. It will obviate the necessity hitherto experienced by the small operators of sending their ores outside of the Province to be refined. The Tacoma smelter, which is said to be owned by the Guggenheims, and in which considerable German capital is interested, has hitherto been tied up with large producers and latterly the amount of ore being treated there practically precluded the small producer on this coast from securing smelter facilities.

It is proposed by the new purchasers to render the plant thoroughly modern and install converters. The blister copper, instead of being sent out of the Province to be refined, will probably be treated at the big interior refineries. The present capacity of the plant is 700 tons daily, but after the additions are made this will be materially increased.

Mr. W. J. Watson, manager of the plant since 1906, leaves for Ladysmith to-morrow morning and will immediately start preparing for the improvements.

Of late rumors of the sale of the property have been rife. First it was reported that the Guggenheims, owners of the Tacoma smelter, had bought it, and then the Consolidated company of Trail was said to have acquired it. Mr. Gardiner states that neither interest is involved in the present transaction. The purchasers, it is said, have already acquired considerable holdings of valuable mineral bearing properties on this coast.

All the employees of the Cobalt mines will receive a bonus of 25 cents per shift as a result of silver having averaged over 70 cents per ounce for the month of November. Approximately two thousand six hundred men are affected, and about \$17,000 added to the monthly pay roll.



# COUNTERCURRENT DECANTATION AT THE HOLLINGER

By Luther B. Eames.

The recovery of dissolved gold from slime pulp in the cyanide process was first accomplished by intermittent decantation. This simple process consists in mixing with the pulp containing the values in solution, a solution of lower gold content, settling the mixture in a tank and decanting the clear supernatant fluid. The thick pulp remaining in the tank is pumped to a second tank together with more barren solution and again settled and decanted. After several repetitions of this operation, values are so far reduced that further washing is not profitable. The gold recovery of this process is high, but the plant required is bulky, labor cost is high and the amount of solution to be precipitated is excessive.

As early as 1901, a plant was built in the Black Hills of South Dakota by John Randall, employing the same principles but attempting to make the process continuous by substituting for flat-bottomed tanks, cones which operated continuously, receiving a constant feed and discharging a steady stream of thickened pulp. These cones were operated in series, the thick underflow of the first one forming, with a stream of diluting solution, the feed to the second cone of the series. Barren solution was added to the tank immediately preceding the discharge tank and, after being slightly enriched by the low-grade pulp in this tank, overflowed to form a diluting solution again for the richer feed entering the third tank from the end of the series, and so on back to the richest tank of the series. Clear water was used for the wash in the final tank. This is the principle on which all successful countercurrent decantation plants operate at the present time, but Randall's plant was not successful because of mechanical difficulties in getting a continuous thick discharge from his cone tanks. A similar plant was built in South Africa although there the washes were not repeatedly used, as in Randall's case, but were precipitated after each contact with the ore. This also was abandoned because of mechanical difficulties and the cost of precipitating the large quantities of solution that had to be used. For a number of years the process was not used, and it was not until the introduction of the Dorr thickener that the minds of metallurgists began to turn again to the continuous decantation principle.

In 1910, two decantation plants were built making use of flow sheets similar to that used by Randall 9 years before, but substituting Dorr thickeners for the cones. One of these was at Moerito in Sinaloa, Mexico, and was installed under the direction of C. Dnppe Smith, while the other was designed by J. V. N. Dorr, assisted by the writer, for the Vulture Mines Co. of Wickenburg, Ariz. While perhaps not perfect at first, both of these pioneer plants were so successful as to encourage further installations, few and scattering at first but in considerable numbers during the past three years.

## The Hollinger Decantation Plant.

The Hollinger decantation plant consists at present of five rows of 40-ft. tanks, four tanks to a row, forming a plant of five units. The tanks are arranged with a difference in elevation of 2 ft. 6 in. between steps with the final tanks of the series the highest, so that all solutions gravitate through and out of the plant to precipitation. The Barret specification roof is supported on flat trusses, the lower chords of which pass

just above the tank and rims. These trusses also serve to support the thickener mechanisms and the walks between the tanks.

The diaphragm pumps used were designed by the Company's staff, and have been very reliable and economical. They are all three-throw or triple pumps so that in spite of the large tonnage handled the duty on each diaphragm is light. It is not uncommon for diaphragms to last 300 days while the life of the present type of valves and seats has yet to be determined.

The pumps are used not only for pulp transferral, but also for the final discharge. This makes regulation of the final discharge for moisture much easier, more reliable, keeps the work of the operator all on the upper floor and allows the tailing to be discharged at a considerably greater elevation than would otherwise be the case.

The barren solution and water wash added to each row are measured by separate float-reading weir boxes assuring uniform results from the various units.

The plant is operated by one man per shift who oils all machinery, watches and adjusts the pumps and records their performance. The solution man makes titrations and regulates the addition of water solution but has no other duties in the decantation plant. A repair man on day shift makes all repairs and has time for other work.

The power for each tank including motor and line-shaft losses is under 1 h.p., while each three-throw pump consumes about the same amount.

The costs for the 12 weeks from Jan. 28, to April 21, 1916, have been taken as typical of what is done by this plant at its present capacity. During this time 85,854 tons were decanted at a cost of \$599 for supplies, including power, and \$1,194 for labor, or \$0.007 per ton for power and supplies, and \$0.0139 for labor, making a total of \$0.0209 per ton for decantation. Labor is no doubt higher here than it will be in the future, as a greatly increased tonnage is to be treated while supplies and power should remain nearly the same. The cost as it stands is about 40 per cent. of the cost of filtering on leaf filters at about the same daily tonnage.

In the ores of the Poreupine district the recovery by dilution seems to be almost the theoretical maximum. Adsorption does not seem to have any appreciable effect. There is a slight dissolving during decantation which, while it adds to the recovery, makes the soluble loss somewhat greater than it would otherwise be.

The figures quoted below on chemical consumption and recovery refer to only two units of the Hollinger plant. The figures of these units are given because the other units of the mill share their feed with the original Moore filter plant, and likewise their barren solution, while for commercial reasons the two units in question have been given a separate solution system and separate precipitation presses. These two units are therefore the only ones upon which all the figures are available.

In comparing the results quoted, however, it should be borne in mind that the flow sheet has been modified in this plant somewhat because of limitations of space, so that the overflow of T 2 instead of that of T 1 goes to precipitation. The effect of this is to raise the theo-

\* Extract from a paper to be read at the New York Meeting, A. I. M. E., February, 1917.



retical value of the overflow of the last tank 3 c. at 3 to 1 precipitation.

A statement of results follows:

Period covered, same as that for which costs were given—from Jan. 28, 1916, to April 21, 1916.

|                                                                                  |                  |
|----------------------------------------------------------------------------------|------------------|
| Tons of ore treated.....                                                         | 38,885           |
| Value per ton of ore treated.....                                                | \$8.92           |
| Ratio of ore to solution precipitated, 100 to 285                                |                  |
| Tons solution precipitated .....                                                 | 110,604          |
| Strength of cyanide used, 0.9 lb. per ton, or                                    |                  |
| .....                                                                            | 0.0045 per cent. |
| Cyanide added per ton of ore.....                                                | 0.46 lb.         |
| Difference between pulp feed and pulp discharge for first tank after agitators.. | 25 c.            |
| Average moisture in tails..                                                      | 45 per cent.     |
| Average value of barren solution.....                                            | 3.2 c.           |
| Dissolved gold per ton of solution discharged                                    |                  |
| .....                                                                            | 11.71 c.         |
| Dissolved gold per ton of ore discharged                                         | 9.57 c.          |

It is theoretically possible, taking into consideration the flow sheet, the grade of ore treated, the barren solution used and the thickness of pulp attained, to have reduced the overflow of the last tank to 7.6 c., leaving a difference of 4.1 c. to be accounted for by continued dissolving adsorption, etc.

Viewed in one way it may be said that actual losses are 54 per cent. higher than theoretical, but where one is dealing with samples so easily affected by faulty manipulation and where any error except losses in assaying tends to raise the results, a check to 4 c. does not seem bad. The average loss would have been somewhat less if the occasional high results had been omitted, but this was not done.

From the foregoing, I believe one is warranted in concluding that a reasonably accurate forecast can be made of the results to be expected from a decantation plant and that these results may compare very favorably with the results obtained from filter plants.

#### STRAIGHT CYANIDATION FOR HEDLEY.

In his annual report Mr. E. E. Merrill, president of the Hedley Gold Mining Co., B.C., said:

"The increased baseness of the ore with depth, which increases concentrate tonnage and lowers the grade of same, necessitates a change in our milling system. We have carefully tested out straight cyanidation of all our ore with fairly good results and we plan to install the necessary machinery for this treatment during the early part of 1916, which we believe will be some improvement over present method of shipping concentrates to smelter."

"Conditions in the lower levels of the mine have, within the last two years, changed considerably. While the orebodies are larger than in the upper levels, and stronger in every way, and, contrary to the rule in most gold mines, maintain at least the same grade per ton; the specific gravity of the ore has increased so that it requires only 10 cubic feet of ore to the ton, where formerly it required more than 12 feet to make a ton. This is caused by the increase in arsenopyrite and adds considerably to the cost per ton of ore milled, as the concentrate tonnage has increased from 3,831 tons in 1913 to 6,218 tons in 1915. This condition, together with war prices and miners' wage increase, all tend to reduce the profits. For this reason tests have been made to determine the most profitable method of treating this ore. For two months 25 per cent. has been treated by total cyanidation with very satisfactory results.

## THE PROBLEM OF EFFICIENCY.\*

James R. Finlay.

If I were to try to do what I fear you may expect me to do—discuss the various technical improvements in the art of mining which have come forward in the past few years—I could do little more than borrow and recite a long list of them; read a catalog, so to speak. Moreover, I should probably be trying to talk about something that your graduating students know better than I do. Nevertheless, I shall try to be technical. Perhaps I may succeed in drawing your attention to some of the most practical of subjects which your graduates will face at once and will continue to face all their lives.

My friend, Mr. Saunders, who was lately President of the A. I. M. E., has introduced me to various people as a "philosopher." I don't know whether he means to accuse me of it or merely to say it; that is, I have never been quite sure whether he meant that I was a philosopher instead of a mining engineer, or whether he meant that I was a philosopher besides being a mining engineer. I mention this as a warning to you and an apology for myself. Even the appellation of "philosopher" you see has its uses and even its privileges. The privileges I am depending on as a philosopher are to talk platitudes, to tell you what you already know and expect to have it pass for wisdom. One of Mr. Roosevelt's great achievements, you know, if not his greatest, was to rediscover the Decalogue. At any rate I mean to talk on the well-worn subject of efficiency.

It occurs to me that it may be interesting, even valuable, to pass in review some of the major conditions under which an industrial career is carried on. I wish to call your attention to the proportion of things in the world's affairs—how important power-driven industry is, how it gives rise to industrial corporations, and how large a part these corporations play in our every-day life, and particularly in the mining business, and how success in the business of mining depends so very largely upon knowing how to deal with them. And through all this I should like to convey the impression that after all there is nothing so great and so valuable as a good mind properly trained.

The essence of modern industry is just this:

A man equipped with his muscles and his brain develops about one-twelfth of a horse-power, and he can use it for perhaps eight hours a day. You pay him for doing this, say \$3. The same amount of mechanical energy, (we will take it at a conventional rate of, say, one cent per horse-power hour) can be purchased in industrial communities for less than one cent. Therefore, it is perfectly plain that in these days when you hire a man you are paying not particularly for his muscular energy, because if you were buying energy you could buy four hundred times as much in another form for the price you pay your laborer. What you pay your laborer for is using his brain to direct not only his own muscular energy but the mechanical energy, so vastly cheap, which can be supplied to him through machines. This I take to be a clear statement and a comprehensive statement of the whole problem of modern industry of any former time in the history of the world.

I see in mining nothing which separates it very widely from other forms of industry. The mere fact that the miner digs material out of the crust of the earth does not make the methods which he pursues essen-

\*From Commencement Address, Colorado School of Mines, 1916.



tially different from those of the man who makes use of materials which are already lying on the surface. The problem of mining industry to-day is the problem of applying the greatest amount of mechanical energy that can be used effectively by a unit of human energy.

Having stated the thing this way we come at once to the very important fact that this problem is the problem of corporate effort and not of individual effort. The energy from a power plant cannot possibly be utilized by a single person; nor can it be built, or the machines in it manufactured, by individuals. Power-driven industry, even in its crudest form, implies collective effort. To take an example from the history of mining: when the gold hunters first came to Colorado, or more certainly when they first went to California, they used no machinery. They used tools, picks, shovels, pans, rockers and wheelbarrows, but not steam engines. So long as they worked that way each man could work effectively by himself; and in the placer days of California nothing was heard of corporations. The gold was produced by a nameless swarm of independent workers. But when they began to undertake to operate quartz mines, in which steam engines must be employed for pumping, hoisting and stamping, that was an enterprise calling for a number of employees, it took collective effort, it produced the corporation immediately. The same kind of illustration can be found in any other industry that uses mechanical power. Thus in transportation, so long as it was a question merely of pack animals or wagons the individual unit was nearly, if not quite, as effective as a corporate unit. One man with his team could haul as cheaply as a company managing ten men with ten teams. Not so when they came to use steam, or any other form of power for transportation. Your locomotive needed a road-bed and rails; it must have cars. The thing needed collective effort and capital.

It seems to me that the development of mechanical industry is greatly widening the exercise of human intelligence. There is exercise for great ability in directing the innumerable business corporations, manufacturing concerns, transportation concerns, mining concerns—in every one of which there is a distinct reward for the man who can make a little better mixture of the ingredients of efficiency. It is not only the managers but practically all of the employees who have a widened scope for the exercise of the brains. Anyone who exercises powers beyond those of his own body is using his intelligence more than he would be if he did not. Thus the man who drives a locomotive must have experience and knowledge above that of the man who simply walks. These are facts which no intelligent man can deny. I believe it to be an absolute fact that those regions and those races which have developed industry best have developed mentality best. They have developed industry because they have had the mentality; and while this is true, I think it is also true that a prosperous industry attracts good human material to it. A man does not think highly who is content with stupid and unproductive labor. Of course people without high intelligence may move a lot of coal and iron; but which is the more intelligent man, he who insists on moving coal and iron with his bare hands or he who wishes to do it with a steam shovel? I think the question needs no answer. Moreover, I fully believe that the man who wishes to use a steam shovel and make it work is the more likely to have valuable ideas about art, literature, science and government or whatever manifestation of mentality is desired.

The proof of the pudding is in the eating! Where are the seats of learning to-day? Where do you go to learn art, literature, science, music—anything you can think of? You do not any longer go to Italy or to Greece or to Egypt to learn these things. You go to the great industrial countries, the United States, England and Germany, and to those portions of France which are more particularly industrial. It should be pointed out that power-driven machinery is made of metals, particularly of iron, and driven by coal. It is natural, therefore, that industry should be most active in those regions where iron can be successfully manufactured. This is the case to a greater extent than most people realize. The areas of the world in which iron is successfully manufactured are relatively small. There are two great areas. A belt bordering the Great Lakes from the upper Mississippi to the Atlantic coast in the neighborhood of New York, and another belt extending from the Irish Sea across England and into Germany, including Belgium and Northern France. These are the areas in which at least 90 per cent of the iron of the world is manufactured, and a very large percentage of the machinery operated. And what do you find there? You find the six greatest cities of the world, one after the other.

The more you examine into it the more you will be impressed by the fact that these areas have become the market and the clearing house of the world's commerce, the centres to which all other metals, including gold, must go to be utilized. You will notice further that these areas hold the reins of power in human affairs. You find there the financial, political, military, intellectual, social and artistic capitals of the modern world to which not only every article of trade, but human intelligence itself, goes for cultivation and development.

It seems to me worth while to lay stress on this situation because a great many people would like to believe that what I have said is not all true. There are those who would have us believe that we are focusing our attention too much on the pursuit of industry and wealth; that by so doing we miss the chance to develop higher and better things. You will be told, for instance, that the growth of corporations is turning us into a nation of employees—another name for slaves; that after all only a few can be leaders, the rest must be followers; and the opportunities for personal initiative and independent action are being swallowed up in a flood of corporation routine which will end by giving human life the monotony of machine-made goods. There may be some truth in this, but whether it is true or not, I believe that we are in an age where the tendency is irresistibly in the direction of the continued growth of corporations. Whether we like it or not, we shall have to accept it. It is an element of common sense to accept the inevitable, not only with resignation but with cordiality.

But I do not look upon this development as undesirable. We are living in a great age, which will be called by future historians the "age of the conquest of natural forces by the human mind." There was a similar age thousands of years ago in prehistoric times when men domesticated animals and plants; when they exchanged the free life of mere hunters for the exacting and settled life of agriculture and trade.

By giving up a portion of their freedom those old people found that they were repaid by a great expansion of the possibilities of life. We are doing the same thing in a different way. The old hunter was persuaded to give up his freedom to wander in order to enjoy



freedom from hunger. Our people are being persuaded to give up a portion of their freedom of individual effort and undergo the discipline of collective effort, for the privilege of having a lot of things and of doing a lot of things which they could not have or do otherwise.

## BRITANNIA COPPER MINES, B.C.

Last summer Mr. T. A. Rickard, editor of Mining and Scientific Press, San Francisco, visited British Columbia. Recently he has been publishing a series of articles descriptive of some of the mines and reduction works he saw in that Province. The following excerpts from his account of the Britannia copper mine and concentrating mill gives authoritative information relative to the mine, which Mr. Rickard designates "the biggest copper mine in the British Empire:

"The joint tramway and railroad terminal is level with Adit 27, so-called because it is 2,700 ft. below the summit of the mountain. This will become eventually the base entry of the mine. Behind the mill is the entry of Adit 41, similarly 4,100 ft. below datum. This adit will become the base exit for ore; it is only 1,400 ft. long as yet, but it will be extended three miles to the ore-belt, and at a mile from daylight it will connect by a raise, or shaft, with the upper adits, called 31, 27 and the present main entry, called The Tunnel, which is 1,900 ft. above 41, and 2,100 ft. above sea-level. The sizes of these new adits are:

|          |             |
|----------|-------------|
| 41 ..... | 9 by 13 ft. |
| 31 ..... | 8 by 8 ft.  |
| 27 ..... | 9 by 13 ft. |

"We went to Adit 27, a short distance south of the incline-terminal. This level was 900 ft. long, and is expected to tap ore at a distance of 10,000 ft., but it will get under the old Daisy workings at a distance of only 2,000 ft. from daylight. The cost of the work is \$13 a foot, the contractor paying for supplies and laying a temporary track. The ground breaks well, but is hard enough to stand without timbering. Two Ingersoll-Rand drills 43¼B, with 3¼-in. cylinder, are used on a 12-ft. bar, which is steadied by right-angle bars against the face.

"The electric train took us up the mountain, along two sharp curves and one switch-back, past the powder magazine, to the Tunnel Camp, as the upper settlement is called. The settlement stands in a clearing made in a dense forest of young pine, overlooked by high peaks. The tunnel, or present haulage adit, is 2,100 ft. above sea-level, 9 by 13 ft. in cross-section, and 4,336 ft. long. Eventually it will be extended through the mountain, right across the Fairview ore-belt. Alongside the track I noted the 12-in. air-pipe, and the high-tension transmission line carrying 6,600 volts. At 4,100 ft. this adit connects with the main ore-chute, 8 by 12 ft., extending for 1,272 ft. between levels. We watched the loading of four cars, of 20 tons each, in four minutes. Ordinary are-gates, 39 in. wide, are used. There are two gates, so that one can be in service when the other happens to be blocked. A vertical board levels the load in the car and prevents contact with the trolley wire. The ore is broken by gyratory crusher in a chamber 400 ft. above the adit, and the chute is fed 800 ft. higher above the crusher, so that a storage capacity of 2,000 tons of crushed ore is obtained, besides 4,000 tons uncrushed ore between the 1,800 and 1,000 ft. levels. Above the top of this chute, on the 1,000-ft. level, there is 4,000 tons more ore stored in similar raises.

"On the 1,800-ft. level, 400 ft. above the haulage-adit, is the gyratory crusher, where the ore is by-passed

from the main chute over a grizzly made of wedge-shaped manganese-steel bars 3½ in. apart. The ore passing through the grizzly joins the crushed product and falls back into the chute.

"Ascending on the cage of the interior shaft, 10 by 20 ft., we reached the 1,600-ft. level, which is 600 ft. above the haulage adit. This shaft was made by raising 1,275 ft. from top to bottom, 75 ft. being required for headroom above the hoist. This level will be connected with an adit advancing from Furry creek, which parallels Britannia creek in the next valley southward. On the 1,200-ft. level I saw a crosscut that was intersecting the Third vein, and then rising to the 1,000-ft. level. I saw the hoisting-engine and the top of the big chute. The seven side-dumping cars emptied themselves automatically as they passed the opening, the wheels on one side running over a dumping-bar so as to tilt the car. These cars are modeled on the design originated at the Phoenix mines of the Granby Consolidated. Listening to the ore as it fell down the chute there came the suggestion that the drop must shatter the ore to pieces so that half of it passes through the grizzly above the crusher.

"From the top of the chute it is only 1,300 ft. to daylight, so we made our exit and saw the old camp. At the portal is the outcrop called the Bluff, which has been photographed often to suggest the bigness of the lode-channel, here fully 300 ft. wide of 1.8 per cent. copper. On the west side of the ravine is a glory-hole on the Jane claim, and the entrance of an adit 1,000 ft. long, all part of the work originally done under Mr. Geo. H. Robinson's direction. But none of this early development sufficed to expose the real dimensions of the ore-belt. It is not a single vein, nor even a series of them, but a big width of schist enriched by seams of chalcopryite. As yet eleven veins have been labeled in a belt 800 ft. wide; the average stoping-width of each vein is put at 30 ft., and the maximum at 80 ft.; but such measurements are only suggestive; the actual width of ground to be stoped is yet to be determined by further operations. In length the separate ore bodies have been proved for 1,000 ft., and in depth for 1,600 ft.

"The chalcopryite is confined mainly to fissured channels in a silicified sericitic schist, adjacent to a diorite porphyry. Near the ore the schist is spotted with chlorite. Any rock broken in the course of exploratory work is sent to the mill if it contains one-half per cent. copper. At the existing price (28c) of copper such material can be treated as 'ore.' The run-of-mine contains about 2½ per cent. copper.

"Re-entering the mine at the 1,000 level, we ascended in the skip to the 500-ft. level. . . . Thence we walked to the other portal of the level truly a 'tunnel,' which is 1,500 ft. long, to the Furry creek side of the mountain. The southern portal, called the Barbara, gave us a new outlook. . . . Examining the rock of the portal, I could see the fresh face of Fairview schist streaked with pyrite and chalcopryite, but not rich enough to be 'ore.' The 500-ft. tunnel is in ore for 1,000 out of its 1,500 ft.; it intersects all the 'veins' from the Second to the Tenth, but it is not at right-angles to the ore-belt, so that the real width of ore traversed is 800 ft. The crosseuts run due magnetic north and south; the veins run S 80 deg. E and dip 70 deg. S with general uniformity.

"On the 500-ft. tunnel horse-traction is employed. It is planned to replace this method with a storage-battery locomotive, also on the 600, 850, 1,000, 1,200, and 1,600-ft. levels; in fact, wherever the present elec-



tric railway does not serve as a means of transport. A 3-ton Westinghouse locomotive with 'exide' (litharge) cells will pull six cars of two tons each. In breaking 2,000 tons of ore daily, 2,000 bits are blunted, and  $1\frac{1}{2}$  tons of powder is consumed.

"In the mine a reserve of 700,000 tons of ore broken by shrinkage is maintained. As for the total reserves, the mine is too young and undeveloped for a precise estimate, but 17,000,000 tons is said to be reasonably assured already. The total cost of producing copper is 7.3 cents a pound."

In the course of his article Mr. Rickard gives much other information including the following: The ore consists of copper pyrite in chloritic schist. The ore picked from the sorting belt in the mill contains from 10 to 18 per cent. copper and represents about one-tenth of the entire mill output, which averages 15 to 16 per cent. as shipped, ore and concentrate, to the smelter at Tacoma. The ore is of medium hardness and breaks readily, loosening the chalcopryite; it is of simple type; with the chalcopryite there is twice as much iron pyrite, beside a little zinc-blende and galena. Associated with these sulphides is quartz. A composite analysis of the mill-feed in September showed 2.74 per cent. copper, 7.95 per cent. iron, 1.5 per cent. zinc, 6 per cent. sulphur, and 71.25 per cent. silica, besides a trace of gold and 25 cents worth of silver a ton. The proportion of picked ore varies in accordance with the smelter requirement of siliceous material.

Particulars of the company's production in 1915, as printed in the Minister of Mines Report, are as follows: Ore milled in 1915, 212,158 tons; product shipped to smelter 30,123 tons, containing: Copper, 9,058,045 lbs.; silver, 50,306 oz.; gold, 398 oz.

The area of the Britannia company's property in the mountains above Howe Sound is approximately 20,000 acres. The company's general manager is Mr. J. W. D. Moodie; its mine superintendent is Mr. W. A. Wylie, and its mill superintendent Mr. C. P. Brownling. At the time of Mr. Rickard's visit the payroll showed 1,225 employees, of 20 different nationalities.

## METALLURGY OF LEAD IN NORTHWESTERN STATES.

In his General Report on "Lead in 1915" Mineral Resources of the United States, 1915, Part 1, pp. 187-205 lately published, Mr. C. E. Siebenthal, of the United States Geological Survey, includes the following information under the head of "Metallurgy":

### Concentration and Separation.

Ore flotation is extensively employed in treating the lead and lead-zinc ores of the Coeur d'Alene district in Idaho. J. M. Callow has stated that a certain flotation process is used at the Gold Hunter, Morning, Hercules, Bunker Hill and Sullivan, Caledonia, Last Chance, Hecla, and Standard mines; that it employs 50 flotation cells and treats daily from 1,500 to 2,000 tons of fines and slimes. Other processes are in operation at the Interstate-Callahan, Greenhill-Cleveland, and other mills in the district.

Ore flotation is employed in the treatment of lead and zinc ores at many places in Colorado and at some places in other Western States. A fair estimate of the additional recovery of lead in 1915, due to the flotation process, is 50,000 tons of metal.

## SMELTERY CHANGES.

The Northport Smelting and Refining Co. composed of persons interested in the Hercules, the Tamarack, and other mining companies of the Coeur d'Alene region of Idaho, has purchased the old copper smeltery at Northport, Washington, remodelled it thoroughly, and given it an equipment of labor-saving devices. Two 250-ton lead furnaces, 42 by 192 inches in size, with an 18-foot smelting column, were added and blown in early in March, 1916, and the construction of a third lead furnace was begun. Three of the six copper furnaces of the old plant were renovated and will eventually be operated. Four Dwight & Lloyd sintering machines will roast the concentrates received at the smeltery. Furnace and roaster gases will be treated by the Cottrell fume precipitation process. The lead bullion will be treated at the affiliated refinery of the Pennsylvania Smelting Co., at Carnegie, near Pittsburgh, Pa.

The Bunker Hill & Sullivan Mining and Concentrating Co. decided in 1915 to build a complete lead smeltery and refinery. Kellogg, Idaho, was finally selected as the place and construction has been begun on a site a mile west of the Bunker Hill mine. The roasting department will consist of a 26-foot Wedge roaster and four 42-inch Dwight & Lloyd sintering machines. There will be three lead furnaces 48 by 180 inches in size, each having a 20-foot 6 inch smelting column. The capacity of each will be 300 tons a day. The bullion will be drawn hot from the blast furnaces by an electric crane to the refinery, which will use the Parkes process of zinc desilveration and will be equipped with two softening furnaces for desilverizing kettles, two refining furnaces, four merchant kettles, a hard lead furnace, and a drossing furnace. The silver refinery will have four Faber du Faur retorts, two coupling furnaces, a fine-silver furnace, and a crucible furnace for gold smelting. Dore bars will be parted by the sulphuric acid process, the silver precipitated by copper and the resulting copper sulphate crystallized and sold. The gases from the blast furnaces, roasters and refinery furnaces will be passed through a bag-house and the filtered gases will escape from a 12-foot concrete stack 200 feet in height.

### Lead Ores Sent to Canada.

Small quantities of domestic lead ores have been exported to smelteries in Canada. In 1912 soft lead amounting to 63 tons was smelted from Wisconsin ores at Canadian smelteries, and in 1913 soft lead amounting to 37 tons from Wisconsin ores and desilverized lead to 98 tons from Idaho and Washington ores were smelted in Canada. In 1914 desilverized lead 31 tons and in 1915 137 tons was smelted in Canada from Washington ores.

## HARGRAVES.

After remaining idle for several years the Hargraves Silver Mines has resumed work on its properties adjoining the Kerr Lake mine.

In the previous operations several promising looking veins were found but aside from the finding of several small pockets of ore, no body of any importance was located. The property is alongside the Kerr Lake mine, one of the most productive mines in the camp.



## FELDSPAR MINING IN ONTARIO.

Ontario, largely owing to the product of one mine, has the reputation of producing the best feldspar in America. Increased activity in the pottery industry, and the possibility of extracting feldspar from potash, have recently drawn more attention to feldspar mines and prospects. The Ontario deposits are therefore receiving more attention than for some time.

Feldspar is not a high-priced article, even under present conditions. The mineral is a very common one; but the buyers want only high grade material. Coarse aggregates of feldspar and other minerals in the form of pegmatite dikes are the chief source of merchantable 'spar.' Of such deposits many are worthless on account of the minerals occurring with the feldspar, many are of doubtful value and only a few of economic importance.

Of Canadian deposits the best known is the Richardson, in Frontenac County, near Verona, Ontario. This is a large deposit of exceptionally clean feldspar which has been worked for several years. It was recently sold by Mr. Richardson, of Kingston, to the Pennsylvania Feldspar Co. This company has long used the Richardson spar in its mills in the United States, and is now producing raw material not only for its own mills but for others also.

The president of the Pennsylvania Feldspar Co. is Mr. S. Harry Worth, who is known to Ontario mining men as the president of the rich Seneca-Superior Silver Mines, Ltd. Mr. W. E. Segsworth, of Toronto, is managing director, and Mr. R. F. Segsworth is secretary. Mr. Ralph Scott, formerly of the Dome Mines staff has been appointed mine manager.

Since the mine was purchased a few months ago, production has been increased and preparations are now being made for mining on a more extensive scale. New mining and transportation equipment will be provided.

The Richardson mine is at present being operated under many disadvantages. The new owners believe that by changing the mining method, putting in new machinery and installing an aerial tramway for transporting the feldspar from the mine to the railway better results can be obtained.

The mining is now being done in the open. The rock is raised partly by an inclined skipway and partly in flat-bottomed boxes by means of derricks. The latter method resembles that in use at the Quebec asbestos mines.

At the surface the feldspar is loaded into small cars and hauled by horses to the edge of the lake. The cars are run onto a barge, which is ferried across to a portage. The cars are hauled across and loaded onto another barge. After crossing this second lake, the feldspar is drawn to a loading pocket at the railway siding, at Godfrey.

Using the present equipment, the new owners have increased production very considerably. They are, however, confronted with the problem of maintaining shipments during the late fall and early spring months when the lakes are impassable. It is the intention therefore to construct an aerial tramway from the mine to the railway. At the mine the method of hoisting will probably be abandoned in favor of hoisting by a shaft which will be sunk to the east of the deposit.

## COAL MINING ON VANCOUVER ISLAND.

With the specific purpose of promoting the commercial and industrial interests of the various parts of Vancouver island, and bringing about increase in trade between the several cities and the producing districts; also to consider the best means of uniting on all matters affecting the general welfare of the Island, members of the Victoria, British Columbia, Board of Trade, and other business men, arranged an excursion to Duncan, Ladysmith, Nanaimo, Alberni, Courtenay, and Cumberland. A large number of prominent merchants, manufacturers, and others concerned, made the trip on November 14-16, and in the course of their travels learned much about the agricultural, lumbering, mining, and other industries of the parts visited.

Included in the published accounts of the trip were the following statements relating to coal-mining on Vancouver island:

### Canadian Collieries (Dunsmuir) Limited.

The visitors were taken on the company's train to Cumberland, where the general manager, Mr. J. R. Lockard, and other officials gave them every attention.

That the Canadian Collieries has spent recently in development alone approximately \$3,540,000; that 2,000 tons of coal are being taken out every day at present, and that a power plant has been installed at Comox Lake of 11,000 horsepower, are some of the facts learned en route. Thus the operations at No. 7 mine were inspected with more than usual attention. Under the guidance of officials, among whom were Mr. Joseph Hunter, chief engineer, all saw actual coal mining under way. Before their eyes the huge electrically driven drum around which winds 7,500 feet of steel rope, was put in motion, and from the bowels of the earth appeared coal-laden cars. The coal was screened, especially for the benefit of the visitors, to show them the stages through which the raw material goes before it is ready for the consumer. The company also is operating at the mine known as No. 8 shaft, a new development. In addition there are No. 4 slope at Comox lake, from which the coal is hauled 1½ miles by electricity to the tippie. No. 6 shaft, 400 feet deep in Cumberland, and No. 5 shaft with a depth of 300 feet.

### Western Fuel Company.

On the homeward trip, a largely attended meeting followed dinner at Nanaimo. After other industries had been dealt with, mining came under notice. Mr. H. B. Thompson, of Victoria, urged that something should be done to utilize the iron ore deposits of Vancouver island. One difficulty in this connection is that of a supply of fuel. He suggested that coal by-products, such as aniline dyes, might be manufactured at such a profit as to make coke cheap and plentiful. If this should be found practicable the fuel problem would be solved and future prosperity be assured.

Mr. Thos. R. Sockett, manager of the Western Fuel Co., said that those at home were doing their bit by trying to keep the wheels of industry moving. The Nanaimo mines were producing to their capacity. The old No. 1 mine is better to-day after thirty years' operation, than ever, and would be going as strong in the next similar period, barring unavoidable mishaps. Four or five miles to the south there were mining developments which promised results. The preliminary work was hard and expensive, and the advance expected had not been made, but it was coming soon. It would mean much to the community and to the island.



His company, he was proud to say, would have taken out 600,000 tons of coal from the two openings this year. This would make it the best in his thirteen years' experience. Next year it was expected to mine 800,000 tons and then 1,000,000 in the twelve months. When the latter figure was reached the ambition with which he had started would be realized. As to Mr. Thomson's suggestion, he said that there was some coal which would not coke. Scientists have been unable to discover the reason or to find the missing link in the composition of the mineral. The coal at the company's new Reserve mine was amenable but the coke would be high in price as the time had not yet arrived when there was a sufficiently large market for the by-products on the Pacific Coast to bring it within the limits of an industrial fuel, but the day was coming when it would be, and then there would be no doubt of the island's future, because rolling mills would be assured. Mr. Stockett also referred to the company's experiment in agriculture which had been carried out on land near Nanaimo, scientifically and systematically, on the basis of a 9-hour day with satisfactory results.

### DOMINION STEEL.

Montreal, Dec. 8.—Mark Workman, who returned to-day from Pittsburg, stated that it was true that large sums of money would have to be spent from time to time on betterments by the Dominion Steel Corporation, but he added that this expenditure would be fully met by revenue and not taken from capital.

Asked as to his mission to Pittsburg the president of the Steel Corporation replied that he had improvements in mind at the Sydney plant, and that with such an end in view he and several officials had gone to the Iron City to get pointers. He explained that the changes at the Sydney works were intended to increase the annual output as well as to decrease the cost of steel productions. Word from Sydney was to the effect that everything is going well, that the coal situation is better and that the outlook generally is exceedingly favorable.

### IMPROVEMENT TO PARRAL AGITATOR.

An improvement in the type of slime agitator commonly known as that of the Parral Tank System of Agitation has been patented by Mr. Bernard McDonald, of South Pasadena, California. The improvement consists in providing the circular tank with a bottom in which is placed a central cone, inverted, and to which the sides of the tank are sloped. This construction forms a trough into which the settling solids are directed and again drawn up to the top of the tank through the air-lifts. The latter discharge tangentially and cause a swirling motion of the slime contents of the tank, thereby keeping them in suspension and affording opportunity for the cyanide solution to dissolve the precious metals in the slime under treatment.

Mr. MacDonald will be remembered as having been prominent in Rossland mining camp, British Columbia, in the early nineties, where he had charge of very important mining operations. Afterward, for some years, he was active in mining in Mexico until the fighting proclivities of the Mexicans made it advisable for mining men from other countries to seek safety elsewhere. Since that time he has had his headquarters in Southern California.

### OCCUPATIONS FOR CRIPPLED SOLDIERS.

By Sir Edmund Walker.

The end of the war is not in sight, but the wounded and otherwise disabled soldiers are coming back, and it is not too early to come to close grips with the problem of finding employment for those who have no claims on previous employers, and of caring for those who are partly or completely disabled.

We have to consider what we owe to the man who has fought to defend our lives, our property and our liberty, and we have to consider how to prevent the disorganization of industrial society when the soldiers come back in large numbers and the making of army supplies has come to an end.

We do not wish the soldiers' home-coming to mean, except perhaps temporarily, a cause of industrial disturbance. We want, on the contrary, to find in it a great opportunity to increase the prosperity and happiness of that part of the Empire which they have fought to save.

We shall have lost forever the laboring power of our heroic dead and of those who are totally disabled. We shall have gained the labor of many women untried before the war, we shall have gained the added strength, physical and mental, of countless soldiers who through the war have "found" themselves; and we shall, in much fewer cases, have returned soldiers who are more or less wrecked physically or mentally but who are not quite useless to the community.

I presume much of the work to be done by the Military Hospitals Commission leads directly to the larger work of land and industrial settlement. For obvious reasons we shall hope that many of the returned soldiers will take up land. The manner of selecting such land so that communities of loyal men shall be planted in every province, of caring for the soldier-farmer in his early years of settlement, and of lending him money for improvements, is of prime importance.

Meantime the Hospitals Commission has, added to its other burdens, the duty of making suitable for work, by training and by the use of newly invented implements, men who would otherwise in many cases be a charge upon the country and a monument of our ingratitude.

In my younger days the one-legged and one-armed soldier was always present, eloquent of war, and not without a meaning to the community,—“lest we forget.” We were used to seeing a bank-messenger with one sleeve pinned to his breast and his handsome commissionaire coat covered with medals.

To-day, every employer of labor, should be considering how he can employ a few partly disabled men, and thus do something more in carrying the burdens of the war.

What the peaceful communities at home must bear in mind is that these men are not rendered unfit for useful work but that they are handicapped or forced by the loss of one limb or sense to put more energy into their remaining abilities.

When everything that human skill and sympathy can do is done, we shall still have some men to be entirely taken care of by the state. I hope that in creating Soldiers' Homes for these, as well as in finding good work for all not totally disabled, we shall completely revolutionize the past and make the name of Canada shine brightly for its wisdom and its humanity in caring for its crippled heroes.



Bonanza Basin, Yukon.



Ground sluicing, Yukon.





Whitehorse, Yukon.



Looking up the Klondike River from Ogilvie Bridge, showing dredge Canadian No. 4.

## THE OLIVER AUTOMATIC SAFETY SKIP

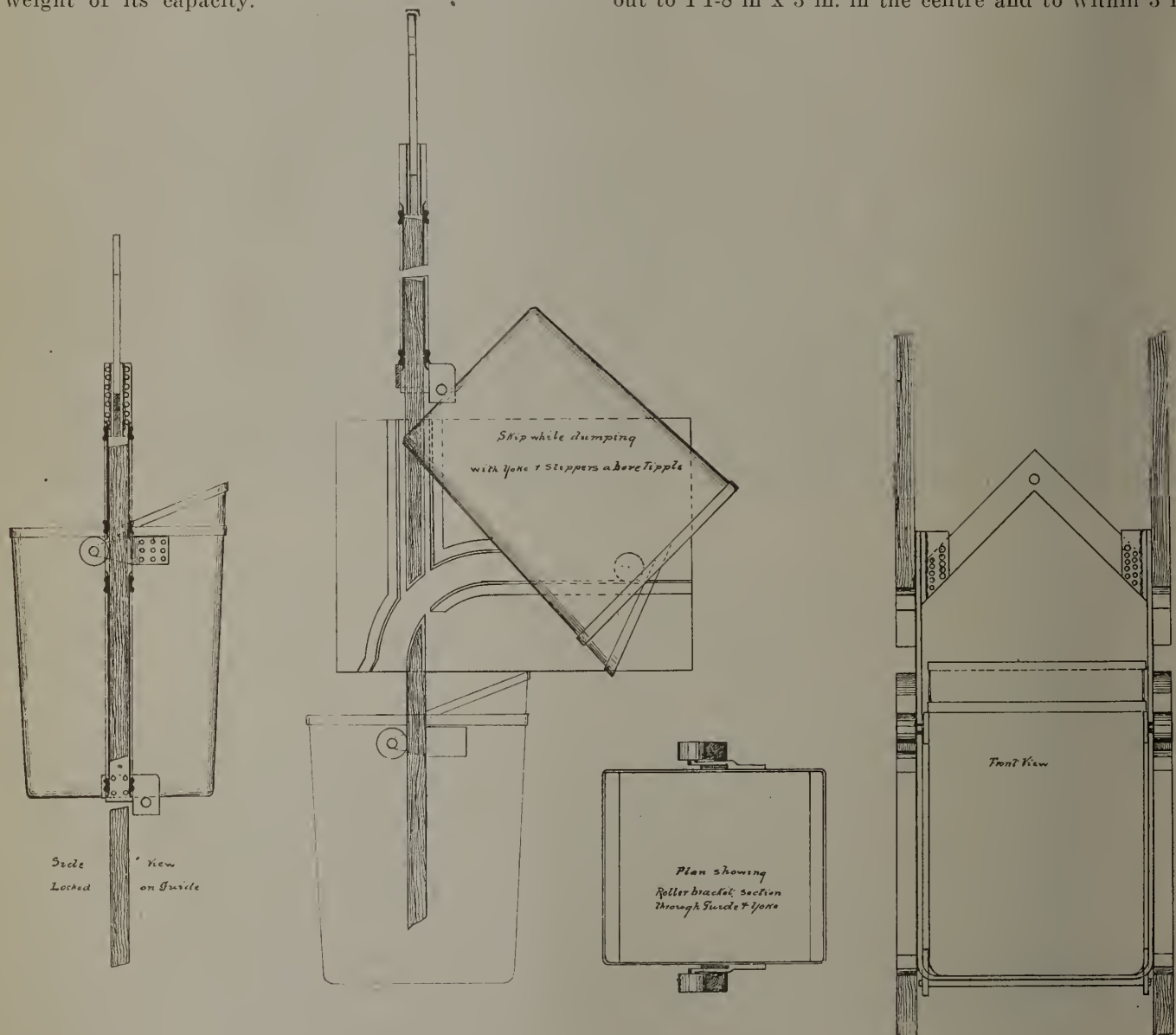
Mr. Frank Oliver, M.E., a member of the Canadian Mining Institute, is the designer of a safety automatic skip for use in vertical shafts, patent for which is being applied for. These skips are now being installed at the McIntyre-Porcupine Mine, South Porcupine.

The advantages claimed for this skip are: 1. The skip when in motion is absolutely locked so that it cannot tip, however loaded, while in motion until it reaches the tipple. 2. The cost of construction on skips of one ton capacity and over is much less than other designs. 3. Low weight of skip compared with weight of its capacity.

which is set at right angles and turned down to 1 15-16 in. The roller is made of cast steel 6 in. in diameter, and the width of guide. It is bored out to 1 15-16 in. to fit the axle of the roller bracket.

The body of the skip is made, as most well built skips are, of 1-4 in. plate for sides and 5-16 in. bottom plate, with 1 in. wood false bottom, with 1-4 in. plate above the false bottom.

The axle on bottom of the skip is made also of mild steel, out of 2 in. square, turned down to 1 15-16 in. ends, where it engages with the brackets or lugs on the bottom corners of the yoke, and is flattened out to 1 1-8 in x 3 in. in the centre and to within 3 in.



The yoke for this skip, shown in the accompanying figure, is made of 3-4 in. x 6 in. soft steel which is carried round the bottom of skip, being rivetted only to a 1 in. x 6 in. soft steel head piece, between angle irons.

The slippers, which stride the guides, are rivetted to the sides of the yoke through U plates holding slipper side plates, the side plates being made of 1-2 in. spring steel. The depth is governed by the size of guides used.

The roller brackets, which act as locks on the sides of guides, straddle the yoke and engage with the guide by means of a roller, the bracket being made of soft steel drawn or forged down from 3-4 in. x 6 in. to 2 in. which is the diameter of the base of the axle,

of the ends, where a collar is shrunk on to the turned portion.

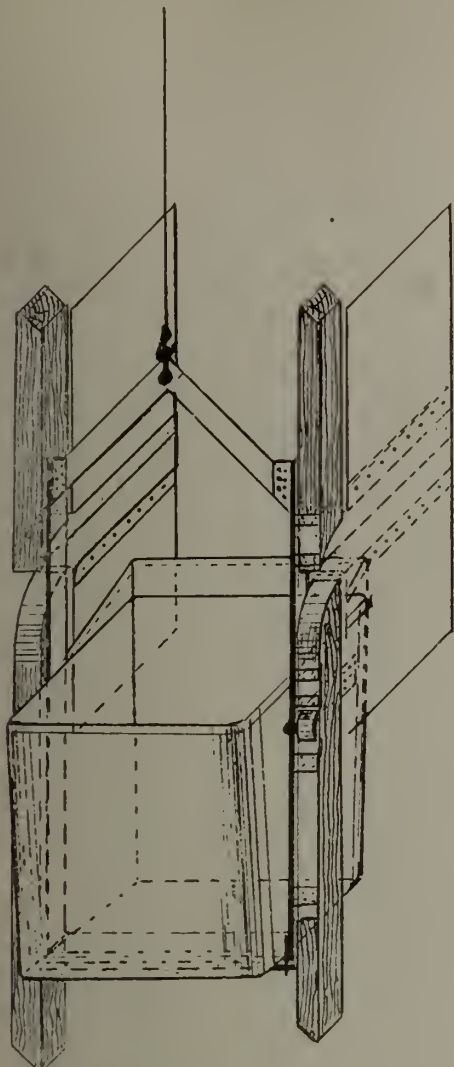
The brackets or lugs on the bottom corners of the yoke which act as bearings for the axle to turn in, are made out of 1 in. x 6 in. mild steel set at right angles on edge, carried through the 6 in. the width of the yoke with a lug turned over to catch the other edge. These brackets are then rivetted to the yoke.

The entire weight of the skip is carried on the yoke and only when the skip is in the act of dumping does any weight come on the axle.

The tipple is constructed of angle irons rivetted to 3-4 in. plates, which plates are bolted to the head frame on each side of the shaft at a point for discharge.



The general construction is such that the skip can be installed in short time. It does away with any extra rail in the shaft to hold the skip from tilting



while in motion. It helps prevention of accidents in the shaft due to upsetting.

On account of the advantages already mentioned, it should meet with a ready demand where companies are installing hoisting plant.

#### CANADIAN MINING INSTITUTE.

A meeting of the Toronto branch of the Canadian Mining Institute was held at the Engineers' Club on Saturday, December 16th. Dr. A. P. Coleman gave an interesting account of a visit to Western Australia. The wonderfully rich mines are thought to be pretty nearly exhausted, but are still yielding a large production. The country is almost a desert, the so-called lakes being merely empty basins in the sand. Water is therefore very costly in the mining districts and the supply is one of the most important items in operating the mines. Dr. Coleman gave an interesting account of the Australian people, whom he found to resemble Londoners much more closely than do Canadians.

Mr. Geo. R. Rogers, a native of Australia, who is now resident in Toronto, and Mr. S. B. Wright of Deloro, Ont., who resided at one time in Australia, spoke briefly after Dr. Coleman and confirmed the accuracy of his observations.

Following the discussion on Australian mines and people, Mr. T. W. Gibson stated briefly the results of metal mining during 1916 in Ontario. He showed that great increases had been made and estimated

that the total mineral output of Ontario for the year would reach a value of \$65,000,000.

#### INTERNATIONAL NICKEL.

The following news item has been published in several American and Canadian newspapers. The authority is not given, and we cannot confirm the statements made, though they agree with other unofficial statements:

"When its proposed construction and improvement work in Canada has been completed, the International Nickel Co. will have increased its capacity approximately 40 per cent., or from an annual output of 60,000,000 pounds of nickel to between 80,000,000 and 90,000,000 pounds. Original plans called for the expenditure of \$2,000,000 on a Canadian refinery. The management, however, decided later to increase facilities all along the line through a single appropriation of \$5,000,000. Smelting facilities at the Canadian Copper works will be enlarged and water power capacity increased.

"International Nickel Co. has between \$8,000,000 and \$9,000,000 cash and securities, including \$2,000,000 Anglo-French bonds. International Nickel handles about 850,000 tons of ore annually, running consistently about 4 1-2 per cent. nickel. Copper values average about one-half nickel content, or 2 1-4 per cent. The company saves about 92 per cent. of its nickel. The nickel to be turned out in the Canadian plant will amount to from 20,000,000 to 30,000,000 pounds a year. With an increase in nickel output, copper production is expected to increase from about 30,000,000 pounds to better than 40,000,000 pounds per annum."

#### THE PRICE OF COPPER.

While spot copper is now quoted at over 30 cents a pound, the average price for Lake Superior copper during the year 1916 will not net the mines quite 25 cents. In fact the average will likely be closer to 24 than to 25 cents. Any mine that can show an average price for its metal for 1916 better than 25 cents will be over the average for the district.

It must be remembered that a full year ago a large number of the mines of the Lake Superior district contracted for their entire output away long into 1916—until May and June—in many cases, at approximately 21 cents. It was good business at the time. Later they contracted for the remainder of the year at 27 and 28 cents for the bulk of the product. Of course the U. S. domestic sales averaged somewhat in between 21 and 28 and 29 cents. And now those that have been able to turn out more copper than their contracts called for are getting 33, 34 and even higher bids for their ready-to-ship copper.

The Daily Alaskan, published at Skagway, Alaska, recently printed the following: High prices are simply killing the prospectors at Nome. With powder fuse and caps away up; coal so high, and provisions out of sight, since the men with the money won't venture, the time is coming when the working man will not be able to. The high rates and higher prices which excuse themselves by reason of the rates are simply killing the camp. Prospectors realize that the time is coming when they must get out of it unless something is done to remedy matters. All the prospecting miners advance the same story and say they knew when they are up against it. It was for this reason, to take care of their little stakes, that so many left on the steamers Umatilla and Victoria. Can you blame them?



## BOOK REVIEWS.

**MINES HANDBOOK.** By Weed. Price \$10. For sale by Book Department, Canadian Mining Journal.

This is volume XII. of Stevens' Copper Handbook. Previous volumes covered the copper mining companies of the world. This volume is not confined to copper mines. In it is much information concerning mining companies producing gold, silver, lead, zinc, etc. It is particularly complete with regard to the metal mines, other than iron, of the United States.

The volume has 11 chapters, compared with 5 in the previous issue. Chapter I, Glossary of Mining Terms, and Chapter II, Mineralogy, The Important Ore Minerals, will be especially valuable to readers unversed in technical and mining terms. Chapter III, a Description of All Known Copper Bearing Minerals, is the only complete list of copper minerals published. Chapter IV has 1162 pages of detailed descriptions of mines in the United States, Canada and Mexico, including amount and location of holdings, finances, profit and loss, geology, nature of ore, output, methods of mining, milling and smelting, probable future, successful or otherwise. Chapter V, the Metal Mining Industry, is particularly interesting as it gives the occurrence, demand for and uses of the different metals, together with production and prices for years back. Chapter VI, A Resume of the Copper Industry, covers this field in a most thorough manner. Chapter VII gives a table of Dividend Paying Companies, also a table of mining stocks listed on the New York Stock Exchange and on the Curb. Chapter VIII includes Data of the World's Principal Mines and a tabular comparison of operations and costs of the "Porphyry Coppers." Chapter IX, List of Obsolete Securities of Dead, Merged, Liquidated or Bankrupt Mining Companies, with references to former volumes in which they are described. A striking innovation is a list of several thousand mining company officials in Chapter X including the name and address of a large number of men connected with the mining industry of North America. The geographical index, Chapter XI, includes the names of the properties described in the book arranged by states, districts or towns for handy reference.

The mine descriptions proper have been more conveniently arranged than heretofore. Black face type has been used to denote the address, capitalization, property, geology, equipment, etc., in each company description. Tabulating has been used freely; this is of especial advantage when making comparisons of operating statement and yearly production.

The vast amount of new data contained in the Handbook makes the work valuable to the mining world.

The annual Northwest Mining Convention, in which numbers of men prominent in mining matters in the Northwestern States are interesting themselves in the expectation of there being a larger attendance than at former annual gatherings under the same auspices, is to be held in Spokane, Washington, during the week of February 19-25, proximo. It is stated that Mr. J. F. Callbreath, of Denver, Colorado, secretary of the American Mining Congress, has promised to be present, and that Dr. George Otis Smith, director of the United States Geological Survey, has expressed his intention to attend if his official duties will permit. The belief is that the gathering will be the largest in the history of the Northwest Mining Convention.

## THE APPEAL OF SIR ROBERT BORDEN FOR NATIONAL SERVICE

The world-wide struggle in which our Empire is fighting for its rights, its liberties and its very existence, has continued for more than two years. Every effort that could honorably be made on our part to avert war was put forth with the deepest earnestness and sincerity. There was no escape from the contest save in dishonor and ultimate disaster. The wonderful extent and thoroughness of the enemy's long and careful preparation was imperfectly understood at first, and the magnitude of the struggle has surpassed all anticipation. Great Britain's first expeditionary force has been increased more than twenty fold and that of Canada more than twelve fold. The climax of the war is rapidly approaching. The last hundred thousand men that Canada will place in the fighting line may be the deciding factor in a struggle the issue of which will determine the destiny of this Dominion, of our Empire, and of the whole world.

The most eloquent tribute would fail to do fitting honor to the youth of Canada who have already rallied so splendidly to the colors and whose heroic valor and glorious achievements have crowned this Dominion with imperishable distinction before the world. Remembering the sacrifice by which that distinction was won, we recall with solemn pride the undying memory of those who have fallen.

In the history of every people there may come such a challenge to the spirit of its citizens as must be answered in service and devotion if the nation is to have an abiding place in the future. The events of this war bring that challenge to-day to the manhood of Canada.

Since the war began more than three hundred and seventy thousand men have enlisted in this Dominion. Two hundred and fifty-eight thousand have gone overseas and more than one hundred thousand are now in the battle line. During the first ten months of 1916, the number sent forward will aggregate one hundred and forty-one thousand. From 1st January to April 15 of 1916 the enlistments were at the rate of nearly one thousand per day. Up to the present our forces have been enlisted and organized more rapidly than facilities of transportation and accommodation in Great Britain could be provided. During the past four months the number of enlistments has greatly decreased, and having regard to future needs the time has come for this appeal.

Notwithstanding the success of the allied forces in various theatres during the past summer, there is reason to know that the enemy is still strong and determined. A mightier effort than may be imagined is necessary to secure a conclusive victory. This war must have so decisive a result that lasting peace can be secured. We are fighting not for a truce but for victory.

In all mechanical appliances which have played so great a part in this war the allied nations have almost if not quite overtaken the enemy's standard of preparation. Therefore the result will depend upon the organization of the man power of the allied nations. Canada must be strong and resolute in that great endeavor.

Our strength can be most effectively thrown into this conflict by utilizing, in all our national activities for sustaining the agricultural, industrial and



commercial stability of Canada, those who through age or by reason of physical conditions are not available for service at the front; to the end that we may place in the battle line the greatest possible proportion of those fit for military service. With this view the government has asked the Director General and the Directors of National Service to undertake duties of the highest importance and urgency. It is imperative that the men and women of Canada, individually and through their various organizations, shall serve the nation in those capacities in which their services may be of the most value. Thus, it is the urgent duty of the Canadian people to join with the government in organizing the full power of the nation in terms of human energy.

Under the responsibilities with which I am invested and in the name of the State which we are all bound to serve, it is my duty to appeal and I do now appeal most earnestly to the people of Canada that they assist and co-operate with the government and the Directors of National Service in the endeavor for this purpose. To men of military age I make appeal that they place themselves at the service of the State for military duty. To all others I make appeal that they place themselves freely at the disposition of their country for such service as they are deemed best fitted to perform.

And to the women of Canada, whose spirit has been so splendid and so inspiring in this hour of devotion and sacrifice, I bid God-speed in the manifold works of beneficence in which they are now engaged, and I pray them to aid still more in every field of national service for which they may feel themselves fitted.

Let us never forget the solemn truth that the nation is not constituted of the living alone. There are those as well who have passed away and those yet to be born. So this great responsibility comes to us as heirs of the past and trustees of the future. But with that responsibility there has come something greater still, the opportunity of proving ourselves worthy of it; and I pray that this may not be lost.

### THE IMPORTANCE OF CANADA'S MINING INDUSTRY.

The wonderful possibilities of northern Ontario were indicated by Mr. Arthur A. Cole, mining engineer for the Canadian Government, and president of the Canadian Mining Institute, in an address to the Empire Club of Canada recently. He said in part:

Canada is a country of large railway development when we consider it on a per capita basis. Most Canadians, if asked why we have so much railway development, will answer that it is primarily with the object of opening up our vast agricultural areas, and likely they would be right.

Now I do not wish for a moment to minimize the importance of the agricultural industry. It is our most important basic industry, but we should try to see things in their true perspective. Now that we have the railways, who supplies the business for them?

Let us take for example, our own little railway, the Timiskaming and Northern Ontario Railway. The T. & N. O. was projected as a colonization railroad to open up the large agricultural areas to the north of Lake Timiskaming, known as the "Clay Belt" of northern Ontario; now let us see who provides the freight for this railway.

During the last five years the mining industry has

been accountable for 47 per cent. of the total freight revenue, while agriculture gave only 13 per cent. or a little over one-quarter that of the mining industry. Let us consider the figures covering the whole of Canada. In the report for the fiscal year, 1913, the department of railways and canals of Canada publishes the following. For the year 1913, the products of agriculture handled by the Canadian railways formed 16 per cent. of the total and during the same period the products of the mines was 38 per cent. of the total, or more than twice as much and these percentages are practically the same for the six years previous. The manufacturer need not think that he makes a better showing than that, for manufacturers came one per cent. less than agriculture.

These are facts that we can not get away from and must show us that from a railway standpoint, at least the mineral industry is of immense importance.

### Canada's Mineral Production.

"Our total mineral production now amounts to 150 million dollars annually, of which our own province of Ontario produces nearly one-half. In the list of our mineral resources you will find that there are very few of the important ones missing and in some of those we have the lead of the world.

Our coal resources are among the greatest in the world.

Our asbestos deposits in the eastern townships of Quebec supply most of the asbestos of commerce.

The greatest nickel deposits of the world are located at Sudbury.

Ontario has the largest body of high grade tale on the continent at Madoc; the largest body of high grade feldspar on the continent in the Richardson Mine near Verona; the greatest mica mine on the continent at Sydenham and the greatest graphite mine at Calabogie.

A recent molybdenite find within 35 miles of Ottawa may soon outstrip all rivals.

We have one of the richest silver mines in the world at Cobalt.

We have the most promising of the younger gold camps on the continent at Porcupine.

Our smelters at Deloro and Thorold produce more refined cobalt than all other refineries in the world put together.

With such a magnificent heritage we would be very delinquent if we did not give the mineral industry the careful attention that it deserves.

### A Promising Feature.

Forecasts for the future may be considered superfluous, but I think in this case that they may help us in a campaign of better preparedness for the future. Again, let us turn to our northland for inspiration. Anyone who looked over the unbroken forests of northern Ontario a dozen years ago and predicted that this district would soon be producing twenty millions in gold and silver annually would have been put down as a fantastic dreamer. But that is a fact to-day, and the output is continually increasing.

Only a small portion of the country has been prospected. Running northeast and northwest from Cobalt and extending to the Arctic Ocean is the greatest Canadian pre-Cambrian shield, the basement formation of the continent. It contains thousands of square miles and offers to prospectors better chances of locating valuable mineral deposits than can be found in any other country of the world.



## THE FREEZE-UP

By J. Harmon Patterson.

My instructions were very definite. I was to proceed to D——, Northern Ontario, where I would meet a gentleman named Byers, outfit and escort him to the company's property at Turtle Lake, which I was to show to him. A postscript further explained that the gentleman aforesaid was entirely unaccustomed to bush travel and that no pains were to be spared to make him as comfortable as possible on the trip.

Now all this would have been natural and right in the proper time and season, but it was now the middle of November. By great good luck the streams and lakes might remain open and passable for two weeks, so I wired Tom Carter, an old prospector of long experience, promising him double pay and advising him where to meet me. I also sent the same instructions to Fred, an Indian whom I had frequently employed and on whom I knew I could rely.

With my employers I knew well by past experience that it was no use to object to any order received. They accepted no excuse for failure. They paid well and never objected to a heavy expense account, if the end warranted it. Results they wanted and results they got. But I had grave misgivings as I shook hands at D—— with a mild and spectacled gentleman, who informed me that he was Mr. Byers.

"I am afraid we are rather late in the season," he remarked, "but I am informed that if I do not see that property now I will not have another opportunity for six months, and though there may be some hardship attending the trip I think I am quite equal to it."

It was plain that he had no idea of the situation.

"It may be that you may have to walk," I replied, "still I think with luck we can get out before the freeze-up. I have with me two of the best men in the whole north country and I can assure you that come what may you will be well cared for."

"So be it," he said. "I am ready."

I was taking a grave chance and I knew it well, but at the same time my instructions were definite, and I knew that under any conditions which we might encounter we could make our charge comfortable and that counted for much. The warmest clothing that the place afforded was procured for him.

We took two canoes, one small and light for Byers and Tom. Fred and I took a very much larger one which from its build I judged would be safe in rough water. There were several large lakes to be crossed and the small canoe, while easier for travelling in, might have to be abandoned if the weather proved unfavorable.

Our trip to Turtle Lake was rapid and uneventful. Byers enjoyed it very much and he lost no time in making his examination of the property.

When we awoke on the fifth day after our arrival we found the ground covered with snow. A cold wind was blowing and it was freezing hard.

"We are sure up against it now," said Byers, "for winter is here in earnest."

"How much time will you require to complete your work?" I asked.

"I am quite satisfied," he replied, "and do not think it is necessary to remain longer."

I was glad to hear this and in less than an hour we were on our way. A strong wind was blowing and the snow began to sift down through the trees. The water froze on our paddles and our hands were numbed with the cold, but we pushed on as rapidly as possible.

We started out next morning in the midst of a blinding snowstorm. It was very cold and the ice was taking rapidly.

Early in the afternoon we reached the mouth of the river. The wind was still blowing a gale, driving the snow in horizontal sheets down the lake. It was seven miles to the portage. The white capped waves were rolling high and Byers declared that it was sheer madness to attempt to cross. He said he would rather walk all the way around than venture out on that angry water in such a frail craft. But we had no alternative.

Byers and Tom took the large canoe and the outfit while Fred and I took the other and most of the provisions. Byers insisted that he be given a paddle and we set out.

We had to cut the waves at an angle and while the large canoe rode the seas like a gull we soon found that our only chance was to run straight before the wind.

Fiercer and stronger came the angry gusts of snow laden wind and higher and higher rose the waves. The other canoe had drawn far to our left and the point which we hoped to reach was yet three miles distant when a cross sea caught us and half filled the canoe. It took some careful work on the part of Fred to hold it on its course while I bailed. We were now wet to the skin.

"Don't think we'll make it," said my companion, "Better tie that line around you, then you can get canoe if we upset."

I did as directed, but I had no hope of reaching shore. Once in the icy water we would soon be chilled. But still we kept on, now balancing on top of some huge wave, now plunging down to what seemed certain destruction, then up again and ready for another plunge.

Still we were afloat and still the dim outline of the point grew ever nearer. A few minutes more and we would be safe. "To the right, to the right," called my companion. I tried to turn quickly to meet another cross sea, but it was useless and in the angry turmoil of waters we were overturned.

By the aid of the line I drew myself up to the canoe. We succeeded in righting it and I clasped my hands across the bow, while my companion did the same at the stern.

The pitiless snow and spray drove on my face while the chill from the icy waters seemed to reach my bones. I could not see the shore as my back was towards it.

Suddenly I saw Fred's shoulders rise above the water. He was on the bottom. I tried to stand but could not bend my knees. Without a word my companion proceeded to drag the canoe ashore and me along with it. Fortunately the shallow water extended all the way.

In a few minutes Fred had a fire burning. To this he dragged me as though I were a log. He then took off my shoepacks and socks and beat and chafed my feet and legs till, aided by the heat of the fire, I was able to move them. Then a quick run around the fire restored circulation.

We crossed the point but we could not pass beyond it, so we made up a fire and did our best to dry some of our clothes.

A mile away we could see the portage and the comfortable cabin which was there and in which we knew was a stove. But across that mile of angry water we could not pass. The snow ceased to fall but the gale continued.

We saw smoke coming from the chimney and knew that our friends were safe and we also knew that they were dry and warm. I could picture them standing beside the stove drinking hot tea while we shivered in the icy wind beside a fire which failed to even thaw our frozen clothing.

With the setting sun the wind fell and as soon as the water calmed somewhat we made the crossing.

They had hot tea ready for us and wrapped in warm blankets we sat beside the red hot stove and told them of our experience.

"Boys," remarked Byers as we sat around the supper table, "I would not have missed this trip for twice the



value of the property I came to see. Whether we get out by canoe or on foot is immaterial to me. Henceforth count me in as one of yourselves."

"It took him only about twenty minutes to learn to handle a paddle," said Tom.

From a dry cedar log Tom and Fred split out four flat pieces, each about six feet long by six inches wide. These they proceeded to make smooth and to the middle of each they fastened thongs to tie to their feet. "These are ice skis," said Tom, in answer to Byers' question. "By the use of these we can walk on very thin ice. We just slide along and we can pull the canoes after us."

"But what will we do?" he next inquired.

"You will walk around," was the reply.

The snow was a foot deep on the portage next morning and the small lake was completely covered with ice. By the aid of the skis Tom and Fred easily crossed with the canoes while Byers and I walked around.

The next lake was also frozen and the boys proceeded to cross in the same way. But the ice in the middle was too thin and Tom, who was in the lead went through. Though he was able to support himself on the ice in front he was in a critical situation for he was unable to crawl out and the boards on his feet kept them well afloat. If he lost his hold on the ice he would have no chance whatever. Fred at last got an axe and proceeded to break the ice behind so that Tom was rescued from his perilous position with the canoe. They were then compelled to break the ice for a considerable distance before it became solid enough to bear their weight. When at last they reached the shore we had a fire going. Tom changed his clothes and after a good drink of hot tea declared that he was none the worse for his plunge.

The next portage was long and the snow made the traveling bad. The short winter day had closed when we reached the river at the far end. Here we camped. We had only enough provisions for another day as most of our supplies were lost in the lake.

The route now lay down the river till we reached a large lake at the far end of which was the railway. The distance was about fifty miles with twelve portages, most of which however were short. The cold was still severe and if we were frozen in now we would have nothing to eat.

Byers had turned in so we talked the matter over and decided to make a dash to the railway. We would leave the small canoe as the large one would hold us all. Though our charge might not be as comfortable as usual he could stand it for one day at least.

"What's the matter boys?" inquired Byers, as we awoke him about four o'clock next morning.

I told him breakfast was ready.

"Breakfast," he said sleepily, "why I only lay down a few minutes ago."

"I hope you will sleep in a real bed tonight," I remarked.

"We mean to try and get through to-day."

"Why I thought you told me that it was fifty miles?" he said in surprise.

"Nevertheless I think we will succeed bar accidents," I replied.

"I won't make it a bet," he said laughing, "for the odds are too great against you, but I will give each of you a ten-spot if you get there."

On the crooked river in the darkness we could not go quickly. At last it opened into a long narrow lake, and then we began to make time.

After passing the lake the river was larger. There were many rapids and we ran them nearly all. On the short portages Tom and Fred picked up the canoe, one at each end, and carried it over. On none was any time lost.

It was about five o'clock when we reached the lake. The next four miles were made in the teeth of a gale, but

it soon subsided and we made the other shore and coasted along in the shelter. As the wind died away the cold became more intense. The sides of the canoe and our paddles were coated with ice. Once Byers became so chilled that we had to land and make some hot tea to warm him up.

Out of the darkness ahead came a distant rumble. It grew louder, then died away. Again it came and this time accompanied by a shrill whistle.

"A train, by all the Gods!" exclaimed Byers.

At ten o'clock we arrived at the hotel, very weary and very cold. I was informed that we were too late for anything except a cold lunch, but Byers knew a way and in a few minutes all the help which the proprietor could muster were busy.

Next morning when we looked out over the lake it was a sheet of smooth ice as far as the eye could reach.

### SIR SAM VISITS BOURKES.

Cobalt, Dec. 12.—A large crowd gathered at Cobalt Station this morning to meet Sir Sam Hughes who was on his way north in company with some Toronto men to Bourke's where he has some mining interests. At Cobalt Sir Sam renewed old acquaintances and spoke to those who had gathered there to greet him. Representatives of the Cobalt Town Council were present, also members of the Temiskaming Conservative Association. At Bourke's the party visited the Murray Moeridge mine and were shown over the property by the manager, Mr. George C. Thomas, formerly manager of the Dome Lake Mine at Porenpine and of the Hudson Bay Mine at Cobalt. The party were taken down one of the shafts.

### REPORT PRODUCTION OF SPELTER IN CANADA.

The Mines Branch, Ottawa, has just issued a report, by Dr. A. W. G. Wilson, on the production of spelter in Canada. This report contains the results of an investigation into the costs of the various raw materials required by the zinc smelting industry, made during the months of May, June, and July, 1916, and supplies estimates as to the probable cost of these materials at certain points in Canada. The conditions under which Canadian zinc ores are now sold to a foreign market are discussed, and the terms of a number of contracts for these and similar ores are stated. The report is concluded with a statement of the author's personal opinions in regard to certain matters in connection with the home treatment of British Columbia zinc ores.

### CANADIAN ZINC.

The greater part of the production of zinc ore in Canada is from British Columbia. The ore shipped contains also a varying silver content, for which payment is made by the smelters, and without which, on account of the import duty to the United States and the long rail haul, it would not in many cases pay to ship. The Slocan mining division produced about one-third of the total output in 1915—Nelson about one-fifth, and the balance came principally from the Ainsworth and Fort Steele divisions.

In Quebec, the property at Notre Dame des Anges, Portneuf county, which is being operated by the Weedon Mining Company, has shipped several hundred tons of ore.



## ON THE FEASIBILITY OF SMELTING ORES IN BRITISH COLUMBIA.

In a report on the production of spelter in Canada, Dr. A. W. G. Wilson summarizes his opinions as follows:

1. So far as the actual operations of a smelter are concerned, the cost of smelting in the Crowsnest Pass area or on the Pacific Coast would not be much greater than in the middle Western States where coal is used for fuel, and with co-operation between all the interests concerned, it could be carried on here as cheaply or cheaper than elsewhere. The cost in the natural gas areas in Canada would be greater than in corresponding areas in the United States, but not at all prohibitive. The author considers that it is not in the public interest to permit natural gas to be used for zinc smelting. The difficulties of obtaining skilled labor and trained supervision are not insuperable, most of the raw materials apart from ores, could probably be obtained locally. If suitable ores were available for treatment, spelter could be produced at a cost which would compare favorably with the cost of production by these methods elsewhere.

2. The author is in accord with all previous investigators in concluding that it has not been demonstrated that British Columbia silver-lead-zinc mines are capable of producing enough high grade zinc ore concentrates to support a smelter operating on the Belgian or any similar process. There is not a sufficient tonnage of high grade ores known to be available without importing foreign ores; the silver-zinc concentrates now produced are of too low a grade to be treated commercially in a smelting plant whose only source of supply is these ores; the tonnage produced is too small; the output is too irregular; the methods of concentration now in use, with two exceptions, are inefficient and wasteful; there is a great lack of co-operation among the various producers.

3. An independent zinc smelting plant would be handicapped for lack of a silver refinery. It would have to consign all lead and silver residues to the smelter at Trail, or to Helena, Montana, entailing additional freight charges against the ore and curtailing the possible profits to the smelter. The alternative would be to establish its own refinery, which would necessitate entering a limited market on a competitive basis for lead ores. The operation of silver refineries to treat retort residues only has not proven to be a profitable operation for the zinc smelters. Such a plant would probably be unable to secure any revenue from sulphuric acid, made as a by-product at most United States plants.

4. It would have been commercially feasible to have established a zinc smelter on the Pacific Coast any time during the first half of the year 1915, to treat British Columbia zinc ores, and ores from Australia. The product from such a plant would have found a ready market for certain classes of munition work, but would not have been suitable for making brass for cartridges and shell cases. Owing to the prevailing high prices of zinc this plant would have easily paid for itself during the first year of operation, the production of zinc ores in British Columbia would have been greatly stimulated, a better knowledge of the possibilities of zinc mining in British Columbia would have been obtained, and the returns to producers would have been greater than they have been.

5. As an alternative, it would have been commercially feasible to have established a zinc smelter in the Crowsnest Pass area, or to have rehabilitated the old Frank smelter at any time during the first half of the year 1915, to treat zinc ores from the Kootenays. The supply of ore available would not have been adequate for a large plant, but foreign ores could have been imported. The conditions of the zinc market and the preference that would have been given in the home market, would have made such a venture profitable for a time. The quantity of zinc that could have been produced would have been less than if such a plant had been established on the coast, because the ores available are of a lower grade than the Australian ores, are more difficult to treat and are limited in quantity.

6. There is a notable lack of co-operation among the independent zinc producers. The organization of a Zinc Producers Association to supervise all matters of common interest, and to enable the various producers to co-operate more closely with each other, in matters of mutual concern, would tend to improve conditions in the zinc industry.

7. The majority of the coal producers in the west do not appear at any time to have been willing to make any serious effort to assist in the establishment of a zinc smelting industry. The prices quoted, so far as they have come under my observation, with one exception, are higher than are usually demanded in other fields for products of similar grade. When one considers that there is a considerable quantity of material, now a waste product, that could be utilized by the zinc smelter, it would seem that more encouragement might have been given.

8. The establishment of the new electrolytic plant at Trail, and the proposed establishment of the plant at Nelson by the French Complex Ore Reduction Company have materially altered the situation with respect to a market for British Columbia zinc ores. The process being used at Trail is still undergoing development, and the Consolidated Mining and Smelting Company is not in the market to purchase zinc ores, having an ample supply of their own. As soon, however, as the initial difficulties are overcome it is their intention to purchase ores suitable for treatment in their plant, and subject to the market demands for spelter. The capacity of the plant will be such that they should be able to treat a large percentage of the zinc output of the Kootenays.

9. The establishment of a zinc smelting plant in British Columbia at the present time does not appear feasible for the following reasons:—

- a. Inadequate supply of suitable ores.
- b. Inadequate supply of suitable labor.
- c. Lack of knowledge of suitability of local clays for retort purposes.
- d. High cost of structural materials, including fire brick.
- e. The retorting process is not especially adapted to treat the complex silver-lead-zinc ores which comprise the bulk of the British Columbia output, whereas developments now going on in electrolytic processes give promise of a solution of this problem.
- f. The electrolytic processes also give promise of a greater adaptability to the peculiar needs of British Columbia ores. If these processes are successful it may prove to be possible to treat some ores locally in plants of smaller unit size than are practicable in smelting by a retort process.



## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA.

Ore receipts at the Consolidated Mining and Smelting Co.'s smelting works at Trail, West Kootenay, in 1916, up to the week commencing December 8, totaled 465,230 tons as compared with 441,085 tons during the whole of the calendar year 1915. These figures show an increase in the expired portion of 1916 as compared with the full year 1915 of 27,145 tons. Unless there shall be a considerable decrease in receipts for the remainder of December, it may be expected that the total increase for the year will be about 50,000 tons. As there has also been an appreciable large increase in the output of ore from the respective mines of the several large copper mining companies, without any considerable decreases in output from other mines as a whole, it is believed the total of ore produced in 1916 will be found, when the revised returns of production shall be available, that the year has been a record one in this particular as well as in output of some of the lode metals. A rough estimate of the value of the mineral production of 1915 indicates that the total will be approximately \$45,000,000, but this may not be stated definitely, since returns of metal recoveries by some of the larger companies have not yet been received.

#### East Kootenay.

It is stated that ore will be shipped during the winter from the Park mine, situated one mile and a half northeast of Marysville. A trial shipment of 12 tons was made to the smeltery at Trail last April. Supplies for the winter's requirements have been taken from Fort Steele to the Victor mine, at which ten men are working, and, having seen everything in shape for the season's operations, the owner, Mr. A. B. Abernethy, has gone to Spokane, Washington. Preparations are being made to ship ore from the Dexter property, Wildhorse creek. Throughout the winter ore is to be raw-hided from the Lead Queen mine to Briseo; a contract has also been entered into for raw-hiding ore from the Isaac mine to Briseo, which is a station on the Kootenay Central railway 48 miles south of Golden. During the first quarter of 1916 137 tons of ore from the Lead Queen mine was received at Trail. In his report for 1915 the mining recorder for Windermere division described the Lead Queen property as a group of five claims on Frances creek, on which considerable work had been done. The group was bonded and work started in August of that year; twelve miles of wagon road was constructed at a cost of \$10,000, and a similar sum was spent in development work. The Isaac is in the same part of the division, and the work done on it in 1915 included building cabins, beside constructing a wagon road and taking in material for an aerial tramway.

#### Boundary.

At the Granby Consolidated Co.'s smelting works at Grand Forks, states the Gazette, a fifth blast furnace was blown in on December 7, four furnaces only having been running for a short time. There had been a temporary suspension of work at the company's mines at Phoenix, for two days, owing to coke shortage at the smeltery having necessitated curtailment of smelting. From the same source it is learned that there were then 16 miners working on Wallace mountain, near Beaverville, which is in the western part of Greenwood mining division. The King Solomon copper mine, in

Copper camp, west of Greenwood, will be worked throughout the winter, with Mr. J. Wilson in charge. Ore hauling by motor truck from the Union mine, in Franklin camp, some 50 miles north of Grand Forks, has been abandoned and now ten horses are employed hauling ore to the rail head at Lynch creek.

#### Kamloops.

In a special issue of the Kamloops "Standard-Sentinel," information relative to the Iron Mask mine, situated at Coal Hill, a few miles from the town of Kamloops, is given as follows: The Iron Mask has, with very short periods of inactivity, been steadily developed and has at times shipped large quantities of ore, concentrates and matte to Coast smelters. On this property, which consists of some ten claims, there has been done underground work to the extent of 16,500 ft., of which 1,200 ft. is shaft sinking and the remainder drifts, cross-cuts, and raises. The main shaft on the Iron Mask claim itself is a three-compartment shaft 780 ft. in depth. The greater part of the development work has been done on this claim and on the Erin lying directly east of it. The surface equipment is modern in every respect and is being added to as requirements demand. Power for operating it is derived from the Kamloops City hydro-electric power system; the owners of the mine have constructed their own transmission line from the municipal power house to the mine, a distance of six miles. The Iron Mask concentrator is of unit construction, operating on the gravity system; its present capacity is 600 tons of ore per 24 hours. It will be practicable to double the capacity at minimum cost without interfering with operation of existing unit, and if such increase be made present mine hoisting equipment will suffice to hoist the additional quantity of ore. Experiments are being made with a flotation concentrating process, which promises an increased percentage of recovery of metals. During the past year extensive development work has been done with the object of determining the extent of the orebodies occurring in the mine.

A first shipment of 33 tons of ore from the Windpass claim, Chu Chua, was received at Trail early in December. Eight months earlier 52 tons of ore reached Trail from the Foghorn property, also in the northern part of Kamloops mining division. The Canadian Northern railway passes through the district. The cost of getting ore to the smelting works from this outlying region must be considerable, for first it has to be packed or hauled to the railway; then there is the rail haul to Kamloops, and afterward a long rail and steamer distance to be covered between Kamloops and Trail. However, there is no other way of ascertaining the value of the ore in quantity, so claim owners adopt this means of satisfying themselves as to the metal contents of their ores in bulk.

#### Coast District.

A shipment of 41 tons of copper ore has been made from the Monitor mine, situated in Alberni mining division, on the west coast of Vancouver island. The resumption of work at this property recalls the fact that fifteen to sixteen years ago it was regarded as likely to become an important mine. In his official report for the year 1900, the district Gold Commissioner gave some particulars as follows: "The Monitor Mining Co.'s property, situated on the Alberni canal, and distant from the town of Alberni about 18 miles, comprises



a group of five claims, namely, the Nahwhitka, John Bull, Uncle Sam, Monitor No. 2 and Monitor No. 1. All the development work has been done on the Uncle Sam claim, which is distant from deep water a distance of 2,200 ft., and is connected by a double rope aerial tramway with the company's wharf. At the lower terminal of this tramway there has been erected an ore bunker with a capacity of 400 tons, and from this terminal to the wharf a trestle tramway has been constructed, fitted with a turn-table and tippie, so as to admit of the loading ore on to steamships with a 4-ton ear. At the upper terminal of the tramway there is a 50 ton bunker, which is connected with the mine by a part drift and part incline tramway. Development consists of a tunnel 170 ft. in length and a shaft 35 ft. in depth, together with some stoping work. On the dump and stored in the bunkers there is 500 tons of ore. During December, 1900, 178 tons was shipped to the smelter at Tacoma, Puget sound, Washington, which ore, after deduction of freight and smelting charges yielded a profit of \$12 to \$15 a ton. The official report for 1901, after stating that toward the end of the summer operations had been suspended at the mine pending reorganization of the company, gave the following information: "In 1901 there was done 240 ft. of work. The ore is chalcopryite mixed with magnetic iron. From seven shipments to the Tacoma smelter, amounting in all to 992 tons of ore, an average value of \$30 a ton was obtained. On the property there is an aerial tramway, a hoisting plant and the necessary skips, pumps, etc. A manager's office and quarters, bunkhouse and storerooms, men's sitting rooms, dining rooms, kitchen and messhouse at the mine, with blacksmith shop and hoisting house have been erected, while on the water front there has been constructed a good shipping wharf. There are some 60 tons of ore on the dump, and the face of the two drifts, where work was discontinued, showed a shoot of ore 6 ft. by 4 ft." In 1913 the property was visited Mr. D. G. Forbes, mining engineer, whose report to the Provincial Department of Mines included the statement that the aerial tramway had been wrecked; the hoist, vertical boiler and horizontal plunger pump, still at the mine, had been ruined by exposure, and that the mine workings were full of water. However, the property has been leased by Mr. J. A. Skene, who last summer did development work in it, employing ten men, and he now plans to continue shipping ore to Trail if the results of the first shipment shall warrant his doing so.

#### General Notes.

Nine tons of ore was recently shipped from a molybdenum property in Lillooet mining division.

Boring operations in the neighborhood of Barkerville, Cariboo district, have been suspended and the drill stored for the winter.

It is reported that the dam on Swift river, constructed six or seven years ago in connection with the Quesnelle Hydraulic Gold Mining Co.'s water supply system, has broken and that the resulting flood has done damage down the Cottonwood river.

Short course classes in mining and associated subjects are to be commenced at the University of British Columbia early in January. Geology, mineralogy, assaying, metallurgy and other subjects will be included in the courses, which are designed especially for prospectors and miners.

It has been announced in Vancouver Island newspapers that the Canadian Collieries (Dunsmuir) Limited will grant to all miners and day wagemen in its

employ at its collieries at Cumberland and Extension a war bonus of five per cent. as from the first day of 1917. It is stated that this action was taken spontaneously by the company, no application for it having been made by its numerous employees. The output of coal from the company's mines in 1916 was more than 50 per cent. greater than for the year 1915, and its production of coke was also much larger.

#### MINING IN YALE DISTRICT, B.C.

There are five or six mining divisions in Yale district of British Columbia, but, generally speaking there has not yet been much metalliferous mining done in them on an important scale, at least not as regards ore production. The largest shipper of ore in recent years has been the Iron Mask group, in Kamloops division, but as no information has been supplied when written for, particulars are not available for use at this time. In the Highland Valley region of Ashcroft division ore has been shipped from two properties, namely, the Snowstorm and the Chataway groups, respectively. Smeltery returns from 96 tons from the former, published in the Annual Report of the Minister of Mines for 1915, show about 3 oz. gold and 200 oz. silver to the ton and 30 per cent. copper; this, however was hand-sorted ore.

Leaving out of present account numerous other properties in the big district of Yale, some particulars follow relative to the Chataway and Tamarac groups, in Ashcroft division, and the Aberdeen group, in Nicola division. In the former a large interest is held by Spokane men; the latter is understood to be a Seattle, Washington, enterprise.

#### Highland Valley Co.'s Property, Ashcroft Division.

The Highland Valley Mining and Development Co. was organized under the laws of the State of Washington and registered as an Extra-Provincial Company under the Companies' Act of the Province of British Columbia. The first work to be undertaken by the company was the development of the Chataway and the Tamarac groups of mineral claims held under bond and situated in Highland valley, south of the town of Ashcroft, B.C., from which town they are distant about 30 miles by wagon road. In response to a request for particulars of progress made, Mr. Frederic Keffer, of Spokane, Washington, president and general manager of the company, has been good enough to supply the following notes:

The year has been taken up with development of the mine, road building and construction of a mine camp, and erection and equipment of a concentration mill.

Development consisted of 438 ft. of drifting on the vein (nearly 300 ft.) cross-cutting and raising on the Chataway group, and driving a tunnel 175 ft. on the Tamarac group; total footage of development work, 613 ft. On the Chataway group practically all the work was in good ore, save for about 20 ft.; on the Tamarac it has been in waste to date.

A first-class wagon road was constructed from the main Ashcroft-Merritt road up to the mines, a distance of six and one-half miles. The Provincial Government defrayed nearly one-half of the cost of this road.

Buildings erected in camp were a bunk-house, boarding-house, office, assay office, blacksmith shops, powder house, root house, big barns and some minor buildings.

**Concentrating Mill.**—On December 9 operation of the entire mill was commenced, the crushing section having been tested some days earlier. It is expected



that in the latter part of December the mill will be operating with three shifts employed and that thereafter product will be turned out regularly. The concentrate produced is very good, both in appearance and grade. Having been running only two days, there has not yet been time to make assays, but it is expected the concentrate will contain about 25 per cent. copper.

The mill has three main floors, arranged as under:

On the first floor are two Robb-Mumford-Brady boilers, together 100 h.p.; one 50 h.p. engine, one Hardinge conical mill with Challenge ore-feeder, one Union Ironworks (Spokane) crusher with jaw opening 9 by 16, and one pair of the same company's Reliance rolls; also elevator to fine ore bins and trommel screen.

On the second floor are one 35 h.p. engine, two Butchart concentrating tables, four cone slime tanks, one Anaconda de-slimer, an 8 kw. dynamo, a Roots blowing engine, and a small compressor.

On the lowest floor are tanks for concentrate, an Oliver filter, and a flotation concentration machine built by the Nelson (B.C.) Ironworks according to patterns from the Minerals Separation Syndicate; also a Roots vacuum pump for the Oliver filter, and a Fairbanks-Morse Typhoon pump.

At the lake below the mill there is a second Typhoon pump with an electric motor to drive it. There is one 12,000 gal. tank below the mill, another of similar capacity above the mill, and a 2,000 gal. feed-water tank.

Between the mine and the mill there is a gravity tramway 950 ft. long for conveyance of ore to mill bin, the capacity of which bin is 300 tons.

The ore is crushed to 1 1/4th inch size and then passes to rolls from which it is elevated to trommel over fine ore bin, the oversize passing back to rolls. The ore, screened to 3/16th inch size, next goes through feeder to Hardinge mill, and thence to de-slimer, which removes the slimes, these going to the cone settling tanks. The coarse sands pass to the Butchart concentrators and the tailing runs to waste. The slimes and middling go to the flotation machine, the concentrate from which is dried on the Oliver filter. It has not yet been decided whether or not to submit the tailing to the flotation process, but it is thought probable that its metal content will be insufficient to make it worth while doing so.

The ore mined averages 4 to 5 per cent. copper. Capacity of the mill has been planned for 50 tons daily, but in operation it may be found somewhat greater. Concentrate from tables is expected to run from 20 to 25 per cent. copper, and from flotation machine a higher percentage. Part of the flotation plant has been received at the mill; the machine will be set up soon after the whole of it shall have been received.

During the summer and fall about 115 tons of ore was shipped, the teams that hauled the machinery and material for mill having taken to the railway that quantity as return freight. That ore contained approximately 17,000 lb. of copper.

#### Aberdeen Group, Nicola Division.

In his official report for the year 1915, the mining recorder for the Nicola mining division briefly mentions the Aberdeen group, thus: Some satisfaction has been expressed on the bonding of several mineral claims situated on Ten-mile creek, known as the Aberdeen group, to a syndicate headed by T. J. Corwin, of Seattle, Washington, U. S. A. On this property a force of twelve men is now employed; a shaft has been sunk

to 40 ft. in depth, and drifts run on the ore for 35 ft. at the 33ft. level. Drifting is also in progress, both ways from the shaft at the 50 ft. level, the vein extending for 5 ft. between walls, and being apparently continuous. Assay returns show that the average of the ore yields about 4 per cent. copper, 2 oz. in silver and a trace of gold."

A recent account of the property and the work done on it, supplied by the manager, Mr. T. J. Corwin, on request, follows: The Aberdeen group is situated on Ten-mile creek, eleven and one-half miles north of Coyle, the nearest station on the Kettle Valley railway. During the summer of 1916 we built a wagon road seven and one-half miles long at a cost of \$6,000; over this road the ore is hauled to the railroad.

Work was commenced on the property on January 4, 1916. Since that time we have sunk a working shaft to a depth of 150 ft., and a man-way shaft to 100 ft.; the latter would probably be classed as stoping. There has also been done 120 ft. of drifting on the 50 ft. level, 150 ft. on the 100 ft. level, and 100 ft. on the 150 ft. level.

Since June 1 we have erected a dining room and cook-house, to accommodate 40 men; an office and commissary building; boiler house, hoist house, ore hopper and bin, and at the Coyle railway station an ore bin and loading platform.

We have installed a compressor, a 50 h.p. steam boiler and two pumps, with 1,200 ft. of a pipe-line for water supply.

We have shipped 1,374 tons of ore, from which has been produced 200,153 lb. of copper and 460 oz. of silver. We have on the dump approximately 3,500 tons of concentrating ore.

Northwest Mining Truth, published in Spokane, Washington, said early last month: Standard Silver-Lead Mining Co. has recently closed a contract to supply Anaconda Copper Co. with 2,000 tons of zinc concentrate running about 43 per cent. zinc and 20 oz. silver to the ton. The shipments will be consigned to Great Falls, Montana, where the new electrolytic plant is now in successful operation. Mining Truth understands that the contract will net the Standard company between \$40 and \$45 a ton, thus insuring additional profit of from \$80,000 to \$90,000 within the next few weeks. Contract calls for immediate delivery, therefore consignments will be rushed.

At a meeting of the Columbia Section, American Institute of Mining Engineers, held in Spokane, Washington, on November 25, the retiring chairman of the section, Mr. Stanley A. Easton, general manager for the Bunker Hill and Sullivan Mining and Concentrating Co. of Kellogg, Idaho, in concluding an address to the members present, directed attention to an article by Dr. Elliott, formerly president of Harvard University, in a recent issue of the Atlantic Monthly, in which that writer referred to "miners and other adventurers." Mr. Easton deplored such a classification of mining men, and especially by one of such high standing as Dr. Elliott.

The Consolidated Mining and Smelting Co. of Canada, Ltd., with head office in Toronto and mines and reduction works in British Columbia, has declared a quarterly dividend of 2 1/2 per cent., or at the rate of 10 per cent. per annum, payable on January 2, inst.



## PERSONAL

Mr. A. A. Cole, president of the Canadian Mining Institute, has been nominated for re-election.

Mr. Frank Oliver is in Toronto.

Mr. H. H. Lavery, formerly of the Dome Mine staff, is now superintendent of the St. Anthony Gold Mine.

Mr. R. E. Hore of Toronto is in the Michigan copper district.

Mr. Harry Sparks, lately of the Dome Mine staff, is now at the Croesus Gold Mine assisting Mr. Julius Cohen.

Mr. Ralph Scott, manager of the Pennsylvania Feldspar Company's feldspar mine at Verona, Ontario, is visiting in Calumet, Mich.

Prof. A. P. Coleman addressed a meeting of the Toronto branch of the Canadian Mining Institute on Saturday, Dec. 16, his subject being "Gold Mining in Western Australia."

Mr. John D. Ryan, a native of the Michigan copper district, who has attained a position of great prominence in the copper world, has recently purchased a \$600,000 estate near New York City.

Hon. Wm. Sloan, Minister of Mines for British Columbia, was married on December 11 at the First Baptist Church, Vancouver, B.C., to Miss Catherine Fiske McDougall, daughter of Mr. and Mrs. D. McDougall, of 1149 Beach avenue, Vancouver. After a short honeymoon trip to the South, Mr. and Mrs. Sloan are occupying rooms at the Empress hotel, Victoria, B.C.

Mr. F. M. Sylvester, vice-president and managing director of the Granby Consolidated Mining, Smelting and Power Co., when at Prince Rupert, B.C., recently on his way to the company's smelting works and Hidden Creek mine at Anyox, Observatory inlet, was reported to have told a representative of a local newspaper that the big copper companies had been keeping the price of copper within reason. They could have sold their copper to the Allied Governments at a higher price than what had been charged, but did not feel disposed to do so. The Granby company had made contracts for one-half of its output of copper for the next seven months at 25 cents a pound.

Mr. I. I. Felker, who for five or six years has been prospecting gold-bearing gravels on Perkins gulch, a tributary of Lightning creek, Cariboo, B.C., left that district at the end of November with his family, to spend the winter in New Hampshire and Maine.

Mr. A. F. Noel has returned to the Lorne gold mine, Cadwallader creek, Lillooet district, B.C., for the winter, after having for a while sojourned on the Coast.

Mr. J. B. White, of Spokane, Washington, was at the Slocan Star mine, near Sandon, Slocan, B.C., last month, on one of his periodical visits to that property. Besides being a director of the Slocan Star Mines, Ltd., he represents the estate of his father, the late Byron N. White, who held a large interest in the Slocan Star company.

Mr. W. J. Elmendorf, of Seattle, Washington, for a number of years in charge of mining operations in the Coast district, has joined Messrs. G. M. Wells and Donald G. Campbell, the new firm to be known as Campbell, Wells and Elmendorf.

Mr. Frederic Keffer, president and general manager of the Highland Valley Mining and Development Co., returned to his home in Spokane, Washington, about Christmas time, after having been several weeks at the company's mine in Ashcroft mining division of British Columbia.

Mr. L. A. Bonner, manager of the Lightning Creek Hydraulic Mining Co., operating a property situated about two miles up Lightning creek from the town of Stanley, Cariboo district of British Columbia, left that district about November 11 to proceed to England for the winter.

Mr. Randolph R. Bruce, manager of the Paradise mine in Windermere division of East Kootenay, B.C., was in Golden on November 27, on his way to Montreal, Quebec.

Mr. E. E. Campbell, of Anyox, Observatory Inlet, B.C., superintendent of the Granby Consolidated Co.'s Hidden Creek Copper mine, went to Eastern Canada a few weeks ago. He was expected to return to British Columbia early in the New Year.

Mr. H. S. Fleming, chairman of the executive committee of the Canadian Collieries (Dunsmuir) Limited, after a trip of inspection to the company's various properties on Vancouver island, B.C., has returned to New York City.

Following the transfer of Mr. T. A. Spruston from the Canadian Collieries company's No. 7 mine, Comox colliery, to succeed Mr. J. H. Cunningham as superintendent of the company's Extension colliery, Mr. Frank Jaynes was made manager of No. 7 mine, and Mr. H. Sloan manager of Nos. 5 and 6 mines, Comox.

Mr. M. E. Purcell, Rossland, has been nominated as vice-president of the Canadian Mining Institute for the coming year. It is understood that Nova Scotia will also nominate a vice-president. Mr. T. W. Gibson of Toronto and Mr. Chas. Fergie of Montreal hold office for another year.

Mr. C. E. Smith, of South Porcupine and Toronto is being nominated as councillor for the Canadian Mining Institute for the coming year. Other probable candidates in Ontario are W. E. Segsworth, E. P. Mathewson, J. H. Stovel, Norman Fisher, M. Summerhayes, M. B. Baker and R. E. Hore. Ten are to be elected from Ontario.

Seattle, Washington, has been finally decided upon by the Secretary of the United States Department of the Interior as the site for the Northwest mine experiment station. It had previously been decided to place a similar station at Tuscon, Arizona, and another at Fairbanks, Alaska. Strong efforts were made to induce the Secretary of the Interior to choose a site near to the important mining districts of Idaho or Montana, but without avail.

The "Prospector," Valdez, Alaska, says: The season's output of gold in the Nome, Alaska, district for 1916 will have exceeded \$3,000,000, according to Jafet Lindeberg, the mine operator at Nome. "We had a good season at Nome this year," said Mr. Lindeberg, "and I am sure the clean-up will exceed that of any of the last three years. We have found a deposit of tungsten, which apparently is present in considerable quantities."



### MEETING AT ENGINEERS' CLUB

Engineers representing practically every phase of industrial and scientific work in Canada met at the Engineers' Club, Toronto, on Thursday evening, December 28th, to talk over the possibilities in the way of formulating some plan whereby those members who are unable, for any reason, to render service to the Empire in the regular way, may still be of value in the great war by furthering at home the work of munition making, or by giving their services in some technical capacity, so that the general war work may be carried on more efficiently and expeditiously.

Discussion centered around ways and means of using the varied engineering abilities represented at the meeting and many promising suggestions were offered, which will be followed up promptly. The business of the evening culminated in the formation of a strong executive, composed, for the most part, of the chairmen of the local branches of the various engineering societies represented in Canada. Mr. Alfred Burton, who acted as chairman at Thursday evening's meeting, will continue in that capacity, with Mr. Wills MacLachlan as secretary.

The first meeting of the new executive was called for Tuesday evening, January 2nd, in the Engineers' Club. Members of the Canadian Engineering profession, wherever they may be located, or in whatever work engaged, are urged to give careful thought to this matter and send in suggestions to the secretary. There is undoubtedly much that trained engineers can do at home and there is a universally expressed eagerness to do it. Just what particular work there is that each, or any, of us can do is what this new committee will endeavor to find out.

The opinion was generally expressed on Thursday evening that as soon as the Toronto organization could determine that its existence was justified suggestions for the formation of similar committees should be made to other cities and provinces. The idea underlying this suggestion was that every engineer in Canada may have an opportunity to lend his aid. The prospect of some ten thousand trained men of the engineering profession working together to help correlate and perfect the war organization at home is fraught, we believe, with tremendous possibilities. Not the least effect would be the moral influence such action would have on our men at the front, who would hear with decided satisfaction of such a practical movement.

### MINE INSPECTOR KILLED IN SHAFT.

Mine Inspector Thomas H. James met his death in the Red Jacket shaft of the Calumet & Hecla Mining Company, Calumet, Michigan, on Tuesday, Dec. 19. With a party of engineers of the company, he had spent the morning underground at the Red Jacket shaft. Other members of the party had ascended to the surface and the county official was coming up in the cage from the 60th level when a piece of falling pipe crashed through the top of the cage and struck him on the head bringing instant death. It is said that a pipe line two inches in diameter burst near the collar of the shaft. The Red Jacket shaft is a vertical shaft and the falling piece of pipe plunged downward close to 5,000 feet, probably striking the cage at about the fifty-seventh level. Mr. James was alone in the cage.

The deceased was born in Cornwall, England, going to the Michigan copper country 29 years ago. He was one of the best known mining men in the country. Four years ago he was elected mine inspector after serving for one year as deputy inspector under John Ashton. He was 47 years of age.

### TRADE INQUIRIES.

The Department of Trade and Commerce has the following inquiries:

2006. **Iron Pipes.**—Correspondence with Canadian manufacturers of iron pipes, valves and other fittings is asked for by a Newfoundland dealer.

2007. **Infusorial Earth.**—A London firm wishes to get into touch with Canadian producers of infusorial earth who can offer supplies for export.

2017. **Zinc Residues.**—A firm in Landore, South Wales, wishes to obtain zinc residues from Canada.

2018. **Hard Spelter.**—A concern in South Wales operating a copper works is desirous of getting hard spelter from the Dominion.

2019. **Antimony Ore** is required by a firm in South Wales.

2042. **Bronze Powder, Talc and Mica.**—A Manchester firm wishes to enter into correspondence with Canadian exporters of bronze powder, talc and mica.

2051. **Ferro-silicon.**—A Glasgow firm wishes to import 1,200 tons 76 per cent. ferro-silicon over 1917 in approximately equal monthly quantities. Price c.i.f. United Kingdom or f.o.b. and indication of freight. Would like cable quotations. Also inquire for 50 per cent. and 25 per cent. ferro-silicon, but not so urgent as 75 per cent.

In the course of his reply to representations made to him by members of a deputation, the new Premier of British Columbia was reported in a local newspaper to have said: "Relative to alien control of mineral deposits in British Columbia, he believed that while many American interests are pro-Ally there are others not so. There appear to be retarding interests somewhere which do not wish our deposits to be utilized for Imperial purposes, but we will take drastic steps to see that this mineral and any others that are of use to the Empire are made available or else we will stand out of the way and let the Munitions Board act."

An allegation going the rounds of some of the British Columbia newspapers is that were it not for the smelting works at Trail some 25 mines in the State of Washington could not operate at all. An analysis of the ore receipts at the Trail smelter from United States mines in 1916 to December 8 shows that these include 203 tons from one Montana mine; 900 tons from one and 129 tons from four Idaho properties; ten small shipments from Washington totaled 162 tons, and six others totaled 1,948 tons, leaving only five shippers with individual totals ranging from 2,099 to 9,237 tons.

### TORONTO MARKETS.

Cobalt oxide, black, \$1.05 per lb.

Cobalt oxide, grey, \$1.15 per lb.

Cobalt metal, \$1.25 to \$1.50 per lb.

Cobalt anodes, \$1.50 to \$1.75 per lb.

Nickel metal, 45 to 50 cents per lb.

White arsenic, 5½ to 6 cents per lb.

Dec. 22.—(Quotations from Canada Metal Co., Toronto)—

Spelter, 14 cents per lb.

Lead, 9½ cents per lb.

Tin, 46 cents per lb.

Antimony, 18 cents per lb.

Copper, casting, 36½ cents per lb.

Electrolytic, 37 cents per lb.

Ingot brass, yellow, 22 cents; red, 24 cents per lb.

Dec. 22.—(Quotations from Elias Rogers Co., Toronto)—

Coal, anthracite, \$9.00 per ton.

Coal, bituminous, \$10.00 per ton.

## MARKETS

## NEW YORK MARKETS.

Connellsville Coke—

Furnace, spot, \$9.00 to \$9.25.

Furnace, contract, \$4.50 to \$5.00.

Foundry, prompt, \$10.00 to \$12.00.

Foundry, contract, \$5.50 to \$7.50.

Straits Tin, f.o.b., 42.62½ cents.

Copper—

Prime Lake, nominal, 33.00 to 33.50 cents.

Electrolytic, nominal, 34.00 to 34.50 cents.

Casting, nominal, 31.50 to 32.00 cents.

Lead, Trust price, 7.50 cents.

Lead, outside, 7.62½ to 7.75 cents.

Spelter, prompt western shipment, 10.42½ to 10.92½ cents.

Antimony—Chinese and Japanese, 14.37½ cents.

Aluminum—nominal—

No. 1 Virgin, 98-99 per cent., 63.00 to 65.00 cents.

Pure, 98-99 per cent. remelt, 59.00 to 61.00 cents.

No. 12 alloy remelt, 45.00 to 47.00 cents.

Powdered aluminum, 92 to 95 cents.

Metallic magnesium—99 per cent. plus, \$3.50.

Nickel—shot and ingot, 45.00 cents.

Electrolytic, 50.00 cents.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$80.00.

Platinum, \$105.00.

Cobalt (metallic), \$1.50.

Tungsten ore, per unit, \$20.00.

Silver (official), 76⅝ cents.

Metal Products—Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

Sheet Copper—

Hot rolled, 42.00 cents.

Cold rolled, 43.00 cents.

Copper bottoms, 50.00 cents.

Copper in rods (round), 41.00 cents.

Square and rectangular, 42.00 cents.

Copper wire, 40.00 to 41.00 cents.

Copper wire, January, 40.25 cents.

High brass—

Sheets, 39.00 to 40.00 cents.

Wire and light rods, 40.00 cents.

Heavy rods, 38.00 to 39.00 cents.

Low Brass—sheet wire and rods, 42.00 cents.

Tubing—

Braze bronze, 51.00 to 52.00 cents.

Braze brass, 48.00 to 49.00 cents.

Seamless copper, 45.00 to 46.00 cents.

Seamless brass, 43.00 to 45.00 cents.

Seamless bronze, 52.00 cents.

Full lead sheets, 9.25 cents.

Cut lead sheets, 9.50 cents.

Sheet zinc, f.o.b. smelter, 21.00 cents.

|                          |      |      |
|--------------------------|------|------|
| McIntyre .....           | 1.70 | 71   |
| McIntyre Extension ..... | .52  | .53  |
| Plenaarium .....         | ...  | ...  |
| Porcupine Crown .....    | .65½ | .64  |
| Porcupine Imperial ..... | .05  | .51½ |
| Porcupine Tisdale .....  | .02½ | .03  |
| Porcupine Vipond .....   | ...  | .42  |
| Preston East Dome .....  | .04⅝ | ...  |
| New Ray .....            | 1.38 | ...  |
| Teck Hughes .....        | .63  | ...  |
| West Dome .....          | ...  | ...  |

## Cobalt Stocks.

|                        | Bid.  | Asked. |
|------------------------|-------|--------|
| Adanac. ....           | .22   | .30    |
| Bailey. ....           | .06¾  | .07    |
| Buffalo. ....          | 1.10  | 1.40   |
| Beaver. ....           | .39   | .40    |
| Chambers Ferland ..... | .16   | .17    |
| Coniagas .....         | 4.55  | 4.80   |
| Crown Reserve .....    | .35   | .37    |
| Foster. ....           | ...   | .05    |
| Gifford .....          | .04½  | .05    |
| Gould .....            | ...   | .00¾   |
| Great Northern .....   | ...   | .12½   |
| Hargreaves .....       | .12½  | .13    |
| Hudson Bay .....       | 72.00 | 75.00  |
| Kerr Lake .....        | 4.50  | 4.65   |
| La Rose .....          | .54   | .57½   |
| McKinley. ....         | ...   | .50    |
| Nipissing. ....        | 8.80  | 9.00   |
| Peterson Lake .....    | ...   | .15    |
| Right of Way .....     | .05   | .07    |
| Rochester .....        | ...   | .05    |
| Seneca Superior .....  | .02¾  | .03    |
| Shamrock Cons. ....    | ...   | .17    |
| Silver Leaf .....      | .02   | .02½   |
| Temiskaming .....      | .58   | .59½   |
| Trethewey .....        | .16   | .17    |
| Vacuum Gas .....       | .35   | .56    |
| Boston Creek .....     | .94   | .96    |

## MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% MoS<sub>2</sub>, \$14.00 per unit.  
 Ores carrying between 3% and 5% MoS<sub>2</sub>, \$16.00 per unit.  
 Ores carrying between 5% and 10% MoS<sub>2</sub>, \$17.50 per unit.  
 Ores carrying between 10% and 15% MoS<sub>2</sub>, \$18.50 per unit.  
 Ores carrying between 15% and 20% MoS<sub>2</sub>, \$19.50 per unit.

80% concentrates, \$1.09 per lb. of MoS<sub>2</sub>.

Penalties imposed for copper and bismuth.

No settlement made for any molybdic oxide in ores.

Settlement ten days after sampling.

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- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.
- Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.
- Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
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Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.

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Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.

Memoir 73. The Pleistocene and Recent Deposits of the Island of Montreal, by J. Stansfield.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

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Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Map 59A. Wheaton, Yukon Territory.

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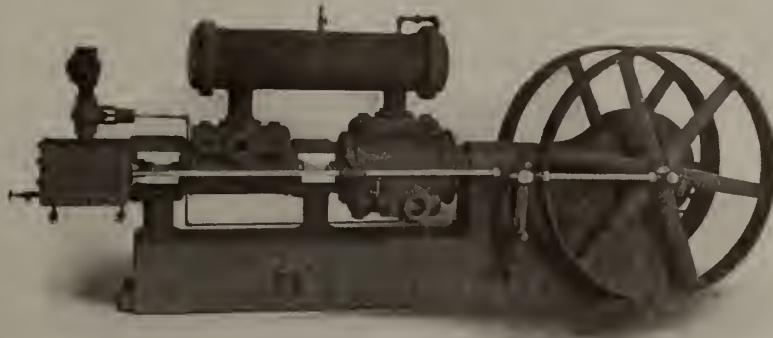
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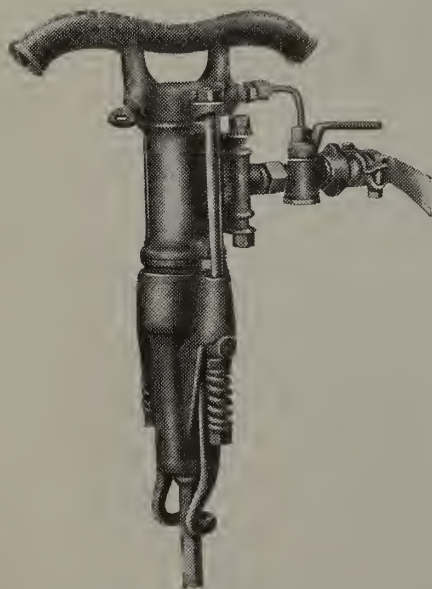
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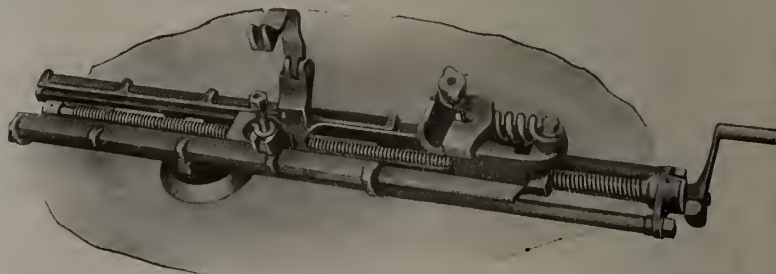
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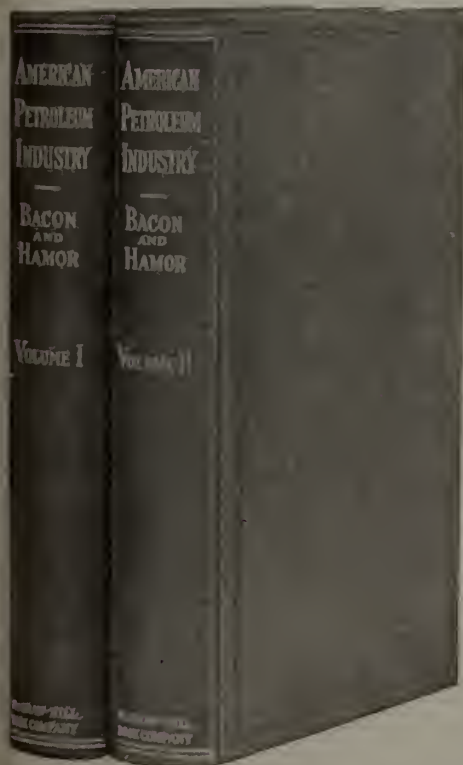
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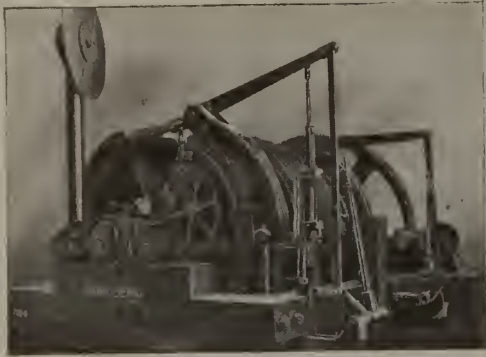
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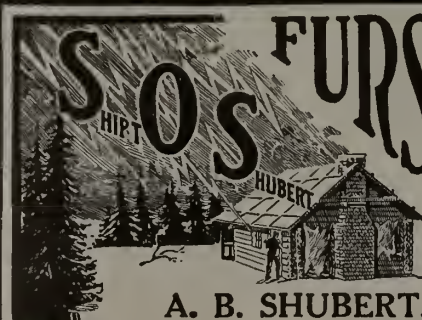
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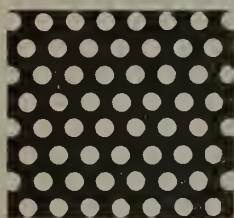
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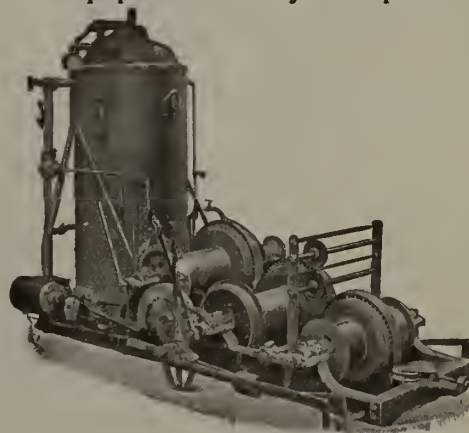
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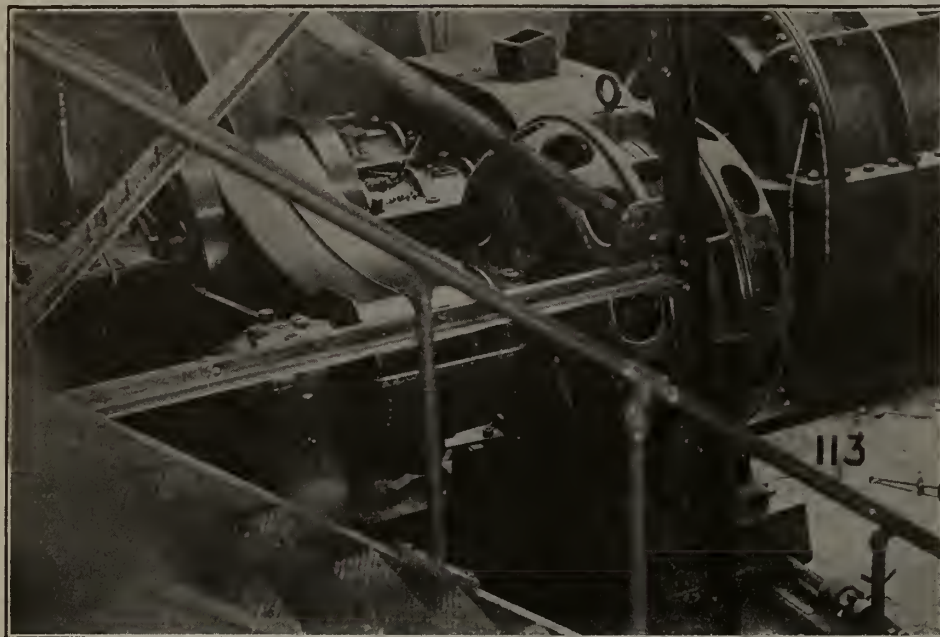
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The plate was exposed fifty seconds while the

## Renold Patent Silent Chain

was transmitting 200 H.P. at 1320 feet per minute.

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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, January 15th 1917.

No. 2

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

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Editor

**REGINALD E. HORE**

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### SUGGESTIONS WANTED

Mining men throughout the country want to do whatever they can to assist the Government in carrying on the war. They will be found willing to help in any work which they believe to be useful. Our readers are doubtless anxious to do what they can to assist those who are endeavoring to devise methods of utilizing the special services which mining men might render.

Not infrequently mining engineers have offered their services to the Government expecting that such services would be utilized to good advantage. They seem to be under the impression that the Government knows just how to use men of special training to best advantage and are disappointed when they find that such is not the case. The trouble is that we depend too much on the Government officials and do not make clear what we think should be done nor suggest how it should be done.

A movement is now on foot to gather information that would be useful to the Government. Mining men who have suggestions to offer are invited to use our columns or to contribute their suggestions to any of the technical societies for discussion.

In addition to suggestions which might help in carrying on the war there is a demand for ideas which might assist in developing our resources after the war and help to defray the cost. The need for the encouragement of basic industries seems now to be more widely appreciated and there is ground for believing that the public will in the future look with more favor on proposals to assist those who would increase production of raw materials. Those of our readers who, in seeking to develop ore deposits, have encountered obstacles which might be removed by united effort, would do well now to voice their opinions. The appointment of a committee of the Privy Council to have in charge the supervision and direction of scientific and industrial research, is an indication that the Government believes that our people want the services of scientists to be more largely used in the development of our industries. The committee is doubtless anxious to learn what obstacles you have encountered and particularly your views concerning the possibility of removing such obstacles.

We all know that our technical literature is largely a record of successes rather than of failures and that there is a paucity of recorded opinions on the causes of failures. Those who are interested in the mining industry cannot therefore depend on the committee, or any other body, to find out what our problems are and remove them. We must explain the difficulties

that are encountered and suggest ways of removing them.

Many of the problems met must be and are solved by the individual companies encountering them. There are, however, problems of more general nature, for the solving of which united effort is needed. A move has been made to get this united effort. It is now up to those engaged in the industries to make suggestions.

### THE NEED FOR AN INVENTORY OF RESOURCES

It has been abundantly proven during the war that men of special training have not been used to best advantage by our military leaders. We can charge this failure in part to our lack of knowledge of the methods of modern warfare, and to our unwillingness to believe that Germany was preparing to make war on the world. In part, however, it is due to lack of information concerning our men and our industries.

When it became apparent in the early days of the war that the services of engineers would be especially useful, engineers throughout the Empire offered their services. Unfortunately the military leaders did not appear to realize that engineers and scientists could be used to great advantage and such offers of service were not highly appreciated. As a result many such men went into the army in positions which might have been as well filled by untrained men. Engineers qualified to take charge of important work were used for work that might have been better performed by husky pick-and-shovel men. Men who would have been invaluable in the production of munitions were accepted for service at the front.

Lately there has been more general recognition of the need for discrimination in recruiting and in providing for the carrying on of necessary work at home. The attempt now being made to carry on the war more intelligently is hampered by our lack of knowledge concerning our citizens and our industries. The need for a detailed inventory of all our resources is being impressed upon us. To utilize our resources to the best advantage we must first know what they are.

At a meeting of the executive committee of the Toronto branch of the Canadian Mining Institute held last November it was decided to ask the Council of the Institute to consider the advisability of urging the Government to take an inventory of our industrial resources. The Council approved of the suggestion and appointed a committee to interview the Minister of Trade and Commerce. The committee was referred to Mr. R. H. Coats, Controller of the Census, who said that his department would welcome suggestions from the Institute. Apparently the Census Branch is the department which the Government considers to be best fitted to consider such suggestions and to assist in carrying out those most likely to be of value.

On December 28th a meeting of Toronto members of several technical societies was held, at the suggestion of Mr. Wills MacLachlan, secretary of the local branch of the electrical engineers' Society, to discuss ways of assisting the Government in carrying on the war. A committee was appointed to organize a movement for utilizing more intelligently the man power of the Dominion.

At a meeting of the Toronto branch of the Canadian Mining Institute held on January 6th, Mr. T. W. Gibson and Mr. W. E. Segsworth reported on what had been done by those attending the December 28th meeting and at a subsequent committee meeting. The Toronto branch appointed Mr. Segsworth as its representative on the engineering societies' committee, and recommended to Council that a census of mining men be taken at once. It is hoped that mining men in all parts of Canada will join with men of other industries and discuss ways of utilizing the ability of engineers and scientists to the best advantage.

### DETERIORATION IN ROCK DRILL STEEL

It is often stated that drill steel deteriorates with use. The repeated blows are said to result in crystallization which weakens the steel and results in increase in breakage. The general belief that such is the case seems, however, to be based more on the plausibility of a theory than on the records of users of drill steel. The following record of broken drills indicates that crystallization from use is not such an important factor in breakage as many believe.

A company using 1¼-in. round hollow drills had the following breakage record: Out of 77,305 drills sharpened in the period Feb. 1 to May 1, 1915, 3,570 drills or 4.62 per cent were broken. The same steel resharpened during the period May 10 to August 9, 1915, showed: Out of 85,882 drills sharpened, 2,883 drills, or 3.35 per cent were broken. In the period March 1 to May 29, 1916, out of 54,285 drills sharpened 1,447 drills or 2.67 per cent were broken.

The same company shows similar results from 1-in. hexagonal hollow steel. Out of 116,750 drills sharpened in the period March 1 to September 4, 1916, 208 drills or 0.18 per cent were broken while out of 132,750 drills sharpened in the period September 4 to December 26, 1916, 86 drills or 0.06 per cent were broken.

This record does not afford much support to the opinion that drill steel deteriorates in service by reason of crystallization, though the higher percentage of failures in steel that has been in service for a shorter time may be due to defective steel breaking soon after being put in service.

If crystallization from service is of any importance at all it is evidently quite negligible in comparison with other factors. In this careful record of a large number of drills there is conclusive evidence that as the steel is longer in use the percentage of broken drills becomes smaller.

The figures given above are also illustrative of another important fact concerning breakage in drills. The use of the smaller diameter drill results in an enormous decrease in breakage.



# COAL TRADE OF NOVA SCOTIA DURING 1916

## A Resume, and a Retrospect.

By F. W. Gray.

With this account of the coal trade of Nova Scotia during 1916, the writer completes a ten years period during which a review of each year's operations has been contributed to the Canadian Mining Journal, and it may be of interest to its readers to briefly look back at the progress of the coal trade during the decade commencing with 1907.

The information contained in the following table has been kindly furnished by the individual coal companies, and with the exception of the figures relating to the smaller companies, may be taken as showing the actual production of the collieries named for the calendar years under review. Statistics relating to the yearly production of Nova Scotia are difficult to obtain, as published tables refer either to sales, or to the fiscal year of the Nova Scotia Mines Department, which ends 30th September.

Dealing solely with the production of Nova Scotia, without relation to outside interests, the following table shows the annual outputs in the decade under review:

### Annual Coal Production of Nova Scotia.

Tons of 2,240 lbs.

|            |           |
|------------|-----------|
| 1907 ..... | 5,775,503 |
| 1908 ..... | 6,076,330 |
| 1909 ..... | 5,106,135 |
| 1910 ..... | 5,817,109 |
| 1911 ..... | 6,362,099 |
| 1912 ..... | 6,995,289 |
| 1913 ..... | 7,263,485 |
| 1914 ..... | 6,650,038 |
| 1915 ..... | 6,715,000 |
| 1916 ..... | 6,173,000 |

### Production of the Coal Companies of Nova Scotia, by Calendar Years.

(Long Tons)

| Companies.               | 1907<br>Tons. | 1908<br>Tons. | 1909<br>Tons. | 1910<br>Tons. | 1911<br>Tons. | 1912<br>Tons. | 1913<br>Tons. | 1914<br>Tons. | 1915<br>Tons. | 1916<br>Tons. |
|--------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Dominion Coal Co.:       |               |               |               |               |               |               |               |               |               |               |
| Glace Bay .....          | 3,541,253     | 3,555,068     | 2,734,774     | 3,526,754     | 3,984,749     | 4,513,269     | 4,739,149     | 4,287,717     | 4,608,979     | 4,091,000     |
| Springhill .....         | 338,857       | 450,292       | 262,985       | 86,982        | 266,308       | 419,096       | 381,434       | 417,406       | 400,791       | 350,000       |
| Nova Scotia Steel and    |               |               |               |               |               |               |               |               |               |               |
| Coal Co. ....            | 638,065       | 680,772       | 813,453       | 840,728       | 780,468       | 841,528       | 813,877       | 752,153       | 611,923       | 605,000       |
| Acadia Coal Co. ....     | 395,963       | 407,439       | 361,279       | 373,550       | 480,648       | 435,654       | 539,121       | 394,397       | 340,975       | 395,000       |
| Intercolonial Coal Min-  |               |               |               |               |               |               |               |               |               |               |
| ing Co. ....             | 307,844       | 305,913       | 293,314       | 264,705       | 262,820       | 235,857       | 189,550       | 213,289       | 177,977       | 144,000       |
| Inverness Coal Co. ....  | 259,056       | 286,234       | 260,858       | 286,935       | 291,753       | 279,318       | 293,847       | 264,842       | 245,579       | 265,000       |
| Maritime Coal, Railway   |               |               |               |               |               |               |               |               |               |               |
| & Power Co. ....         | 63,132        | 59,047        | 127,590       | 181,272       | 169,625       | 166,477       | 155,051       | 141,830       | 175,482       | 198,000       |
| Minudie Coal Co. ....    |               |               |               |               |               | 60,000        | 65,500        | 70,000        | 86,000        | 80,000        |
| Colonial Coal Co. (and   |               |               |               |               |               |               |               |               |               |               |
| successors) .....        | 231,333       | 331,565       | 251,882       | 256,183       | 125,728       | 36,897        | 65,844        | 53,134        | 56,000        | 40,000        |
| Cape Breton Coal, Iron   |               |               |               |               |               |               |               |               |               |               |
| and Railway Co. ....     |               |               |               |               |               | ....          | 8,424         | 49,000        | 6,000         | ....          |
| Other small companies..  |               |               |               |               |               | 7,193         | 11,688        | 6,270         | 5,294         | 5,000         |
| Total. ....              | 5,775,503     | 6,076,330     | 5,106,135     | 5,817,109     | 6,362,099     | 6,995,289     | 7,263,485     | 6,650,038     | 6,715,000     | 6,173,000     |
| Cape Breton Island ..... | 77%           | 75%           | 75%           | 81%           | 80%           | 81%           | 81¾%          | 81½%          | 82½%          | 81%           |
| Nova Scotia .....        | 23%           | 25%           | 25%           | 19%           | 20%           | 19%           | 18¼%          | 18½%          | 17½%          | 19%           |

The relation of the coal production of Nova Scotia to the total Canadian production and to the imports of coal into Canada is shown by the accompanying photograph. Up to about 1898 the coal mines of Nova Scotia produced nearly all the coal output of Canada, and although from that year onwards the output of the Canadian west has steadily increased, yet even to-day no less than half the coal production of Canada stands to the credit of Nova Scotia. Up to about 1910 the importations of coal into Canada were less than the home production, but since that date a significant change is to be noted in the curves, and Canada has ceased to supply its own needs in coal. The drop of imports shown in 1915 may be taken as a passing effect of initial war conditions, and during 1916 and 1917 the tendency of the coal imports to exceed the home production will be found to reassert itself with greater emphasis because of the serious drop in Canadian coal outputs.

The natural progress of outputs was interrupted and hindered in 1909 by the numerous strikes occasioned by the abortive efforts of the United Mine Workers of America to control the miners' unions of the Province. The maximum production was reached in 1913, but the record figure of a little over 7¼ million tons to the credit of 1913 did not actually represent the maximum capacity of the Nova Scotia collieries for output at that time, as the trade depression which preceded the war first manifested itself about the middle of 1913, and the collieries did not work full time during the last half of that year. A production of 7½ million tons probably represents the maximum possibility of the Nova Scotia collieries under present conditions of development, and therefore the output of 6,170,000 tons in 1916 represents a decline of 1¼ million tons below capacity for output.

In a period when the necessity for increased production of raw materials is being preached by the

responsible statesmen of every belligerent nation, this very considerable diminution in the production of our most important raw material is sufficiently serious, particularly so when the low figures of 1916 follow large recessions in output during the preceding years of 1914 and 1915, but a still more serious aspect is the probability that the tonnages of 1917 will show a further decline, probably to between  $5\frac{1}{2}$  and  $5\frac{3}{4}$  million tons, or say two million tons below the maximum possibility.

A combination of circumstances is responsible for the decline in production.

Foremost and chief among these is the loss of 5,000 colliery workers by enlistment for service at the front, and the fact that a preponderating proportion of these enlistments has been from among the skilled underground workers. The colliery districts of Nova Scotia were for a long time the most fruitful field for the labors of the recruiting sergeants, who flocked into the mining villages to recruit men for units having their headquarters as far away as New Brunswick and Quebec. During the past year, recruiting activities have been restricted throughout the colliery districts, but unfortunately the paramount necessity for coal was not recognized by the authorities until the output capacity of the collieries had been irremediably crippled for the further duration of the war, and, even to-day, the men who are helping the general cause by digging coal have been granted no official recognition of their status as munition workers. If the miner is not a munition worker and entitled to an official badge, who is? He produces the basic, indispensable, essential munition of war, without which not a wheel could turn, nor men or shells be forwarded to the front.

Other factors tending to restrict production are the practical cessation of expenditure on new developments since the Spring of 1913, and the increasing physical difficulties attendant on the mining of coal in Nova Scotia, such as increased depths of extraction, increased proportion of coal won from submarine areas, lengthened haulages, and an unfortunate succession of underground fires at the mainland collieries that has considerably restricted production.

All these causes, however, are to-day subordinated to the shortage of skilled miners, and no amount of new development or capital expenditure will permit of an increase in coal outputs until "the boys come home."

The year 1916 has seen a succession of wage increases granted in quicker rotation and more substantial in amount than in any previous comparable period in the history of coal mining in the Province. Increases in wages aggregating 25 per cent have been given within dates less than six months apart. Yet while these increases in wages have within the past twelve months been so accelerated as to attract general attention, the steady increase during the past ten years probably represents a more permanent and serious problem than the temporary unsettling of markets and staple prices by war conditions. During the past ten years a steady upward tendency has been observable in the rate of wages and the price of all materials entering into the production of coal.

The various increases and adjustments that have been made in the wages paid to colliery workers are too numerous and various to be here enumerated, but, generally speaking, it may be stated that wages since 1907 have advanced by from 45 per cent to 50 per cent. For example, the standard minimum daily wage for

ordinary unskilled labor at the mines in the Sydney district has advanced from \$1.38 in 1907 to \$2.10 in 1916.

The increase in the cost of materials is not less striking. The following comparison between the price of certain principal items of colliery material needs no comment.

|                                  | Price in—         |                   |
|----------------------------------|-------------------|-------------------|
|                                  | 1907              | 1916              |
| Pit Horses, each .....           | \$90.00           | \$175.00          |
| Oats, per bushel .....           | .55               | .70               |
| Brattice Cloth, per sq. yd. .... | .13               | .21               |
| Red Brick, per thousand .....    | 8.50              | 13.00             |
| Fire Brick, per thousand .....   | 25.00             | 46.00             |
| Powder, Black, per lb. ....      | .12 $\frac{1}{4}$ | .15 $\frac{1}{4}$ |
| "    Permissible . . . . .       | .15 $\frac{1}{4}$ | .18 $\frac{1}{2}$ |
| Detonators, per thousand .....   | 25.00             | 58.00             |
| Harness Leather, per lb. ....    | .35               | .52               |
| Copper, ingot, per lb. ....      | .16 $\frac{1}{2}$ | .33               |
| Shovels, per doz. ....           | 8.70              | 11.50             |

These are given as representative items, but there are many others. All iron and steel materials, which enter largely into colliery requirements, have advanced from 25 per cent to 50 per cent. Such materials as hoisting and haulage ropes, pit rails, spikes, air and water pipe, pit props and lumber, tub-wheels and axles, boiler tubes and fittings have steadily mounted in price, as have also oils of various kinds, cotton waste, etc.

Legislative enactments have laid additional burdens on the industry. A general increase of the Government royalty on coal was made in 1913, raising this from 10 cents to 12 $\frac{1}{2}$  cents per ton.

The Workmen's Compensation Act of 1910 did not apply directly to the coal companies, who were exempted by virtue of the existence of the Relief Societies, but it necessitated increased contributions to these societies that represented an increased cost of about 1 $\frac{1}{2}$  cents per ton. The Compensation Act of 1915, which comes into force at the beginning of 1917, will cost between three and four cents per ton.

Apart altogether from the increased cost of mining coal, due to the enhanced rates of wages and material costs, is the increase due to the operation of physical causes already alluded to.

The coincident operation of all the foregoing factors of increased cost have brought about a formidable enlargement of the cost of mining and marketing coal, that has not been accompanied by a proportionate enlargement of the selling price. It is true that within the past six months there have been increases in the selling price of coal, and there have been notable advances in the cost of coal to the individual consumer, particularly in the cities, but these increases have represented very largely the greater cost of transportation to market centres and also, to an extent not perhaps appreciated, the greater cost of distribution to the consumer in its final stages. The net enhancement of selling prices at the pit mouth has been far below the increase in the cost of mining, and, if the items of transportation and distribution are eliminated, it may be stated with accuracy that the increase in the selling price of coal as a commodity shows a smaller increment of profit to the producer than other indispensable commodities with which it may fairly be compared, such as flour, leather, groceries and other contributors to the much-debated cost of living.

A statement of wider application may be properly made, namely, that taking into consideration the selling price of coal in other countries, the cost of wages



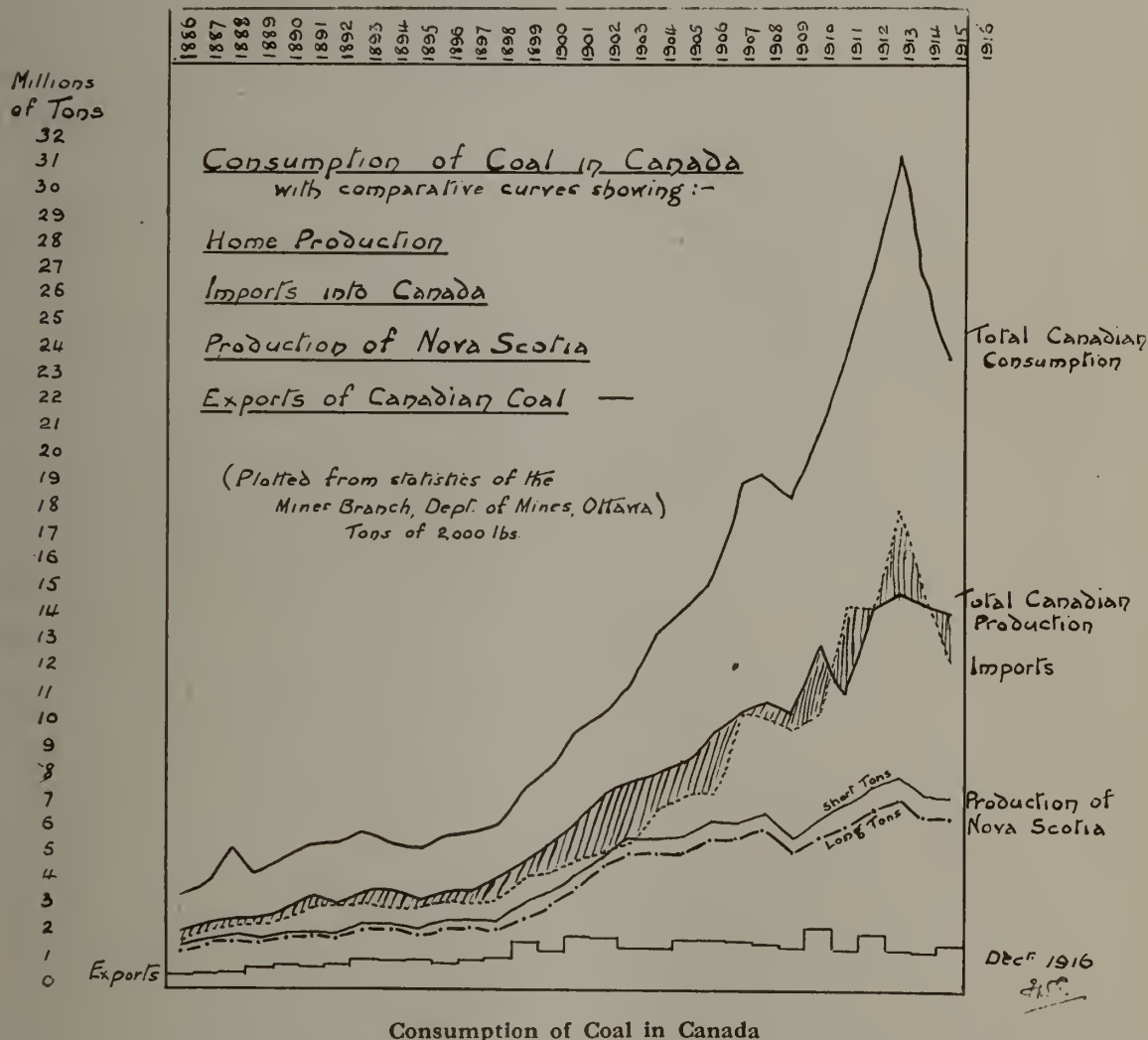
and materials in Nova Scotia, and the margin of profit left to the coal operator, the price of coal in Nova Scotia has never within the past 25 years been sufficiently high to make coal-mining a reasonably paying investment or to secure the financial stability of the companies engaged in the mining of coal in Nova Scotia.

Under the conditions of increasing costs of production combined with stationary selling prices that have marked the last ten years, it has only been possible for the coal companies to show a profit by the introduction of economies of operation necessitating new modern plants and the utilization of refuse coal and by-products. This has required large capital expenditure, but it does not yet seem to have been recog-

diminished output and a sharp demand for bunker coals f.o.b. at Nova Scotian ports, it has resulted in a marked decline in the amount of coal available for the St. Lawrence market. The export of Nova Scotian coal to St. Lawrence ports in 1916 was only one quarter of the normal shipments, and indications are that next year not even this small quantity will be available.

The result is a pronounced increase in the importations of United States coal, at prevailing high prices of transportation and initial cost, and the loss to the Nova Scotia operators of a market that it has cost much effort to cultivate.

From the national point of view the increased revenue of the Customs Department in import duties is scarcely sufficient to offset the foolishness of spending



Consumption of Coal in Canada

nized that such enterprise is not suitably rewarded by a saving in operating costs, unless the margin of profit will also allow for the repayment of the capital invested plus a reasonable interest return. There are very few coal companies in Nova Scotia that have been able to pay an interest return to the common stock shareholders, and the companies are still fewer that have been able to recoup their capital outlay.

It is therefore quite evident, apart from the temporary disturbance occasioned by the war, that a considerable and permanent increase in the selling price of coal is inevitable in Nova Scotia.

A feature of the year has been the insistent local demand for coal largely due of course to the increased consumption of coal in iron and steel manufacture, and when this demand has been coincident with a

millions on the purchase of United States coal, while simultaneously the Canadian coal production is steadily dropping. The effect on our national finances is tantamount to raising a loan in the United States at high rates of interest, and it adversely affects both our money exchanges with New York and our national earning power, to say nothing of the larger question of dependence upon our neighbors for such an essential weapon of warfare as coal.

A matter of some interest to the industry is the coming into effect of the Workmen's Compensation Act of 1915, which operates from the 1st of January, 1917. This Act supersedes the Compensation Act of 1910 and substitutes a scheme of pensions for the lump sum payments that the old Act prescribed in cases of death or permanent disablement. The new Act is largely

modelled on the Ontario Act, and is to be administered by a Government Board dealing directly with the workmen affected. The burdens imposed upon the employer by the new Act are much greater than those of the previous legislation, and this has raised in an acute manner the future maintenance of the colliery relief societies for the disbursement of sickness relief. Seeing that the employer has to pay accident compensation at a greatly increased rate, it is hardly to be expected that he can continue to contribute towards the maintenance of sickness funds also, and thus the workmen, for the first time, are faced with the necessity of maintaining sickness funds at their own expense. The situation is rendered more difficult because the income of the sickness funds has been reduced by the loss of young members who have enlisted, while at the same time, the increased average age of the remaining members has proportionately increased the amount of the sickness claims. Several of the coal companies have offered generous aid to the sickness funds in addition to the payments for accident compensation, but the workmen are finding it difficult to understand the necessity for increased contributions to the sickness funds on their part. The reason is of course that whereas in the past the contributions of the companies were applied to the relief of both accident and sickness, under the new order the companies' contributions will be entirely applied to accident, and while the accident payments will be much more adequate, the workmen will have to bear the deficit in the sickness contributions caused by the diversion of the companies' contributions from sickness relief to accident compensation alone. As there is twice as much sickness disability as accident disability, the difficulty is a very real one.

Once more it is due to the Navy to remind our readers that the coastwise trade of Nova Scotia has proceeded without molestation by our enemies throughout a third summer of war. This statement may seem bald perhaps and trite, but the accomplished fact is a modern miracle, for which, in the words of the new national grace before meat, we "Thank God and the British Navy."

### COAL IN BRITISH COLUMBIA, 1916.

By E. Jacobs, Victoria, B.C.

The gross production of coal in British Columbia in 1916, including the coal made into coke, is estimated to have been 2,795,400 short tons as compared with 2,209,290 tons in 1915. It being the official custom of the province, however, and of the Vancouver Island coal-mining companies too, to record production in tons of 2,240 lb., it will be more convenient to make comparisons in that measure. Accordingly, the gross production in 1916 is estimated at 2,495,893 long tons, against 1,972,580 tons in 1915 and 2,166,428 tons in 1914. The figures given for 1916 are subject to revision, since the production for the month of December has had to be estimated, but it is not thought probable there will be any considerable change made from the total now estimated. The following table shows the annual totals for seven years:

|                        | Tons of 2,240 lb. |
|------------------------|-------------------|
| 1916 (estimated) ..... | 2,495,893         |
| 1915 .....             | 1,972,580         |
| 1914 .....             | 2,166,428         |
| 1913 .....             | 2,570,760         |
| 1912 .....             | 3,025,709         |
| 1911 .....             | 2,297,718         |
| 1910 .....             | 3,139,235         |

The coal-mining companies operating in British Columbia had in 1916 to contend against conditions that were not favorable to a very considerable increase in total quantity of coal produced, and this notwithstanding that the demand for coal was greater than in any of several previous years. First there was a general shortage of labor for coal-mining, caused in part by the enlistment for service in the European war of many of the English-speaking workers, and in part by the continued internment of a considerable number of "alien enemy" miners, who were not permitted to work in the coal mines but were detained under guard in internment camps. Then there were, so far as the mines of the Crow's Nest Pass Coal Co., were concerned, interruptions from an explosion in one of the Michel mines, and the serious damage to the mine making the biggest production at the Coal Creek colliery by a series of "bumps" which caused a reduction of output from that particular mine from 1,500 tons to 500 tons a day. However, substantial progress was made, as is shown in the following figures of production:

### Production of Coal in British Columbia in 1916.

|                                   | Tons of<br>2,240 lb. |
|-----------------------------------|----------------------|
| Vancouver Island                  |                      |
| Canadian Collieries—              |                      |
| Comox (Cumberland) mines          | 453,122              |
| Extension mines .....             | 262,377              |
| Western Fuel Co. ....             | 560,000              |
| Pacific Coast Coal Mines.....     | 155,000              |
| Vancouver-Nanaimo Coal Mng. Co... | 79,957               |
| Total . . . . .                   | 1,510,456            |
| Nicola Valley—                    |                      |
| Inland Coal and Coke Co.....      | 30,849               |
| Middlesboro Collieries .....      | 49,146               |
| Total . . . . .                   | 79,995               |
| Similkameen—                      |                      |
| Princeton Coal and Land Co. ....  | 24,553               |
| Crow's Nest—                      |                      |
| Corbin Coal and Coke Co.....      | 68,896               |
| Crow's Nest Pass Coal Co.—        |                      |
| Coal Creek .....                  | 567,535              |
| Michel . . . . .                  | 244,458              |
| Total . . . . .                   | 880,889              |
| Summary—                          |                      |
| Vancouver Island . . . . .        | 1,510,456            |
| Nicola Valley . . . . .           | 79,995               |
| Similkameen . . . . .             | 24,553               |
| Crow's Nest (East Kootenay)       | 880,889              |

Gross production of coal. 2,495,893

The increase in gross production of coal in 1916 as compared with 1915 was 523,313 tons. With one unimportant exception, that of the Inland Coal and Coke Co. of Nicola Valley, which produced 3,861 tons less than in 1915, all the companies whose figures are given in the accompanying table of production made an increase. The respective increases of the several companies were as follows: Canadian Collieries (Comox and Extension), 287,687 tons; Western Fuel Co., 144,277 tons; Vancouver-Nanaimo Co., 31,981 tons; Pacific Coast Coal Mines, 25,568 tons; Crow's Nest Pass Coal Co (Coal Creek and Michel), 21,965 tons; Princeton Coal and Land Co., 9,005 tons; Corbin Coal and Coke Co., 6,352 tons; Middlesboro Collieries, 1,343 tons; total 528,179. Of this total there must be deducted de-



creases of 3,861 tons of the Inland Coal and Coke Co., and 1,005 tons of syndicate that operated in Nicola Valley in 1915 but was not among the 1916 producers.

Figures of coal made into coke are estimates based on the average quantity of coal it took to each ton of coke in 1915, it is estimated that 92,405 tons of coal was used in making 28,044 tons of coke at the ovens of the Canadian Collieries, Limited, at Union Bay, Vancouver island, and that the Crow's Nest Pass Coal Co. used 187,050 tons of slack coal at its ovens at Fernie to make 129,000 tons of coke, and 164,475 tons at its Michel ovens to make 113,431 tons of coke. The coke figures total 270,475 tons, which quantity, manufactured in 1916, compares with 245,871 tons in 1915 and 234,577 tons in 1914. The coke made at the Crow's Nest Pass Coal Co's ovens was used chiefly at smelting works in the Kootenay and Boundary districts of British Columbia, which works would have taken more coke had it been obtainable; that made on Vancouver island was used at the Granby Consolidated Co's smelting works at Anyox, Observatory inlet.

Concerning value of products, it has been customary to calculate coal at \$3.50 a long ton and coke at \$6. If this custom be adhered to in arriving at the value of the mineral production of the province in 1916, it will give the following results: Net coal (that is, after deduction of 443,930 tons made into coke) 2,051,963 tons at \$3.50, \$7,181,870; coke, 270,475 tons at \$6, \$1,622,850. Total value of coal and coke, \$8,804,720. The value of coal in 1915 was \$5,638,952, and of coke \$1,475,226; total value, \$7,114,178; so the increase in value in 1916 over 1915 was \$1,690,542 on the assumption that similar prices, not higher ones, will be used officially for the 1916 production.

#### Vancouver Island Coal Mines.

The Canadian Collieries (Dunsmuir) Limited, operates several mines at each of its two collieries, the Comox colliery, in the neighborhood of Cumberland, some distance north of Nanaimo, and the Extension colliery, south of that old-established coal-mining center. As no reply was received from an application to the manager, Comox, little can be stated other than that the mines worked were Nos. 4 and 7 slopes and Nos. 5 and 6 shafts. These are the mines in which much Oriental labor—Chinese and Japanese—is used underground; the last published official figures showed that out of a total of 795 employed underground, 376 were Orientals, 185 as miners, 133 as miners' helpers, and 58 as laborers. With the exception of five at Extension, nowhere else in the Province were Orientals employed at mining underground. This has been one of the sources of labor troubles on Vancouver Island, the Cumberland mines being notorious in this direction.

At Extension Nos. 1, 2, and 3 power house a new unit was added in 1916; this increased the power output by about 50 per cent. This unit is a Fleming sett with a 150 k.w. generator and compound engine. In No. 2 mine the No. 4 East section has again been opened and will add substantially to the future production of this mine. Much development work was done in No. 3 mine, the most important of which was the completion of a new air-shaft—a 300 ft. vertical raise. An Ottumwa 50 h.p. electric hoist was installed. At No. 4 shaft the plant has been electrified and power is now available for lighting, pumping, and hoisting purposes. A 4-stage electric turbine pump with 6 inch discharge was placed at the shaft bottom. The slope

sections of this mine, which had been flooded since August, 1912, were unwatered and development work was resumed. In addition to the underground development, there was done about 2,500 feet of diamond core-drilling principally in hard conglomerate strata. At the washery on the shipping docks at Ladysmith a new unit was added and the two old units equipped with automatic positive feed from the bunkers and automatic rock discharge. A recovery plant for washery sludge was also put in. The gross output of coal was nearly 263,000 long tons as compared with 167,000 tons in 1915.

The Western Fuel Co's output was approximately 560,000 tons, as compared with 415,723 tons in 1915. The company operated in 1916 its No. 1 shaft, Esplanade, Nanaimo, and connecting mines, and its Reserve mine, situated five south of No. 1; the coal in the Reserve mine is reached by two shafts at a depth of 955 ft.; from these a rock-tunnel, 8 by 16 ft. in area, is driven across the measures on a one-per-cent. grade to the raise, and it entered the seam at a distance of 180 ft. The shaft bottom is arranged in a most up-to-date way for the handling of large quantities of coal. All the tracks are laid with 30 lb. rails and on a grade of one per cent. from the shaft. All the main tunnels leading to this shaft have been retimbered with 12 by 12 in. timbers. Levels have been driven both westerly and easterly. The seam worked in this mine is the well-known Douglas seam. In one of the reports of the mine inspector it is stated that in the development work done the seam shows a thickness of from one foot to twenty feet.

The Pacific Coast Coal Mines, Limited, operates two collieries, namely the South Wellington and the Morden. The latter is known as No. 3 mine; it is a comparatively new mine, with reinforced concrete head-frame and new equipment throughout. Two shafts reach the coal at about 600 ft. depth; after working for a time on a temporary bottom, a permanent bottom has been made at 6 ft. greater depth, and a rock slope has been driven about 900 ft. The coal is of excellent quality varying in thickness from 5 ft. upward; where the slope entered it the width was found to be 28 ft. Permanent electrically driven pumps have been installed. A new lamp-house and an office were erected and other surface improvements were made during the year. At the shipping place, Boat harbor, seven miles away, a new coal washery was put in, and a new pier was constructed, commencing 60 ft. outside the old T-head pier and extending seaward for 400 ft. Its total width is 45 ft.; its height from the caps to the top of the superstructure is 52 ft. Nearly 500,000 ft. of lumber has been used in making this improvement, a prominent feature in which is a moveable tower for loading the coal, the tower travelling the whole length of the pier on a 12-ft. gauge track. An incline belt conveys the coal from the electrically operated conveyor belt that brings it along the pier above, and delivers it into the hold of the vessel, this loading belt being lowered to 21 ft. or raised as high as 72 ft. above water level, as required by the stage of the tide. The height of the tower is about 60 ft.; its mechanism is operated by an electric motor. Its delivery capacity is approximately 300 tons of coal an hour. This tower is believed to be an unique feature among the coal-loading appliances on the northern Pacific coast, and it is equal to loading with coal the largest ship at the present time voyaging off the Pacific



coast. To facilitate the handling of the coal along the new pier, a big electric generator is being installed in the power-house on the shore and a motor at the end of the new pier.

#### Nicola and Princeton Coal Mines.

The Middlesboro Collieries, Ltd., and the Inland Coal and Coke Co., Ltd., are the principal operating companies in the Nicola district. The latter company is stated to have acquired the property of a smaller neighbor, and the property of the Diamond Vale Company is to be operated under a new organization.

The Middlesboro colliery consists of No. 2 mine, in the Upper or Coldwater Hill series of coal seams, and Nos. 4, 4 East, and 7 mines in the Lower or Coal Gully series. During 1916 no development work was done other than that of extending the main slopes and levels in Nos. 4, 4 East, and 7 mines. No new mines nor seams were opened, nor was there any new plant put in the colliery having been previously well-equipped with tippie, power plant, and all requisite accessories. Demands for coal were light throughout the spring and summer, consequently the mines were worked only about four days a week, but there was a distinct improvement in the autumn, so that during the last three months of the year they were operated full time, and the company was unable to get sufficient miners to allow of its accepting all the business that offered. The output of coal for the year was between 49,000 and 50,000 tons, which was more than that of 1915.

No reply was received from the Inland Coal and Coke Co., but it is known, as already stated in this review, that its production of coal was somewhat smaller than in 1915.

The Princeton Coal and Land Co., Ltd., operating at Princeton, Similkameen, in 1916 added to its coal-handling plant a new bunker and screens to enable pea coal to be made. This colliery is now equipped for shipping coal in the following grades: Lump, over 3-in. bar screen; egg, over 2-in. shaker screen and through 3-in. bar screen; nut, over  $\frac{3}{4}$ -in. and through 2-in. shaker screens; pea, over  $\frac{3}{8}$ -in. and through  $\frac{3}{4}$ -in. shaker screens, and mine-run. These grades all feed on to the same conveyor belt, so that any combination of them, if required, can be loaded into the same railway car. In 1916 considerable underground development work was done, including new haulage-way, new airway, opening No. 2 mine to the surface, new levels, etc. The main slope is now down 2300 ft. and new levels East and West are being laid off at that point. The coal shows marked improvement in quality at depth. In November the output was about 240 tons a day, and it was expected that an increase to 300 tons a day would be made before the middle of December. The year's output of about 24,500 tons compares with 15,500 tons in 1915, the increase being approximately 9000 long tons.

#### Crow's Nest Coal Mines.

No information concerning the Crow's Nest Pass Coal Co.'s mines was supplied. The company's output in 1916 was approximately 812,000 long tons gross; as already stated, it is estimated that 351,500 tons was used in making 242,400 tons of coke, which leaves the net output of coal at about 460,500 tons. At the Coal Creek colliery the mines operated were No. 1 East, No. 2, No. 3, No. 1 South, No. 1 North, No. 9, and B North. A new fan—a Keith-Wheel fan, capacity 100,000 cu. ft. per min.—was put in at No. 1 North and

No. 1 South. The damage done by "bumps," to which reference has already been made, was in No. 1 East mine, which had previously been the most productive mine of all being worked at Coal Creek. The mines worked at the company's Michel colliery are No. 3, No. 3 East, and No. 8 North. Repair work has been in progress in No. 3 East since the explosion in that mine last August, but no coal was being produced.

The Corbin Coal and Coke Co.'s production of nearly 69,000 long tons of coal shows an increase as compared with its output in 1915 of more than 6000 tons. There were not any new developments in the underground workings, but at No. 3 open-cut mine, also known as the "Big Showing," which is worked both on the surface and underground, stripping work was continued. Additions made to equipment for stripping were one Class 45C Bucyrus steam shovel and eight 20-yard air dump cars. A transfer plant was put in and connected with the Marcus screen at No. 4 mine, this being to handle the coal from the open-cut whenever grading and sorting of that coal is required to be done. The coal is dumped from the railway cars into a hopper feeding on to an apron conveyor 172 ft. long, which conveys the coal up a pitch of 11 deg. and discharges it on to the Marcus screen, where it is screened.

#### Mine-Rescue and First-Aid Training.

During 1916 there were issued 103 certificates of competency in mine-rescue work, as compared with 57 in 1915. Most of the men who passed the examinations in this connection were trained at the Provincial Government mine-rescue stations. The number of men who obtained the St. John Ambulance Association certificate of competency in first-aid work was 124 out of the 220 who attended the lectures at the coal mines. Not all presented themselves for examination, however. In 1915 the number at the coal mines who passed was 242, and in 1914, 85.

## AMERICAN INTERNATIONAL MINING SOCIETIES

### Special Correspondence.

In North America there are at least two great international societies whose activities are connected with the mineral industry. These are the American Institute of Mining Engineers and the Geological Society of America. Both of these societies include many Canadians in their membership, and men from Canada nearly always occupy places at the council boards of each. At times it would appear that Canadians, owing to the liberal spirit shown by United States members, occupy more than their due share in the councils. In 1917, for instance, the president of the Geological Society is a Canadian, and two vice-presidents were born in Canada. Two years ago the president was also a Canadian. It is very pleasant to Canadian members to find such a broad, truly international spirit prevailing in this Society.

The meeting of the American Institute of Mining Engineers takes place annually in New York in February. This year's meeting is to be a very important one, and should be attended by all Canadian mining engineers who can find time to do so. The home of the Institute is the finest building devoted to engineering to be found anywhere. The annual meeting is inspiring, and a visitor should not fail to see the splendid combined library of the Institute and other engineering societies.



The meeting of the Geological Society of America is held annually between Christmas and New Year's day. This year's meeting was in Albany, the capital of the Empire State. It was one of the largest and best that has been held. The president was Dr. John M. Clarke, the distinguished State Geologist of New York. The Geological Survey of this State is the oldest in America, having been in continuous operation since 1836. The first State Paleontologist, the late Dr. James Hall, and Dr. Clarke have a continuous service record between them of over eighty years. And it may be added that Dr. Clarke should easily add twenty years more and thus round off the century of service. That the New York Geological Survey has had a wide influence on science, not only within the boundaries of the State but elsewhere, is shown, for instance, in the wide use of such formational names as Trenton, Utica, Hudson River, Medina, Clinton, Oneida, etc., etc. It was a pleasure to the visitors in Albany to see that this the oldest of the state surveys not only shows no signs of decadence but as the years go on it is increasing its field of usefulness, both in an educational sense and in a direct economic way. It was a source of satisfaction at the more formal meetings to hear leading statesmen of New York speak so highly and appreciatively of the work of Dr. Clarke and the members of his staff.

It is recognized by everyone that, in order to achieve the best results, scientific work should be supported, not fitfully or spasmodically but continuously over a long period of years. New York is a good example of what may be achieved by such support. That this state is not alone in the fine position she occupies as an encourager of science was made evident when the veteran and ever youthful Professor B. K. Emerson of Amherst College playfully told Dr. Clarke at the annual dinner that, while the latter and his predecessor Dr. Hall had a service between them of over eighty years, he, Professor Emerson, and his predecessor, the late Professor Hitchcock, in the chair of geology at Amherst could claim an unbroken record of over ninety years.

New York state has recently erected at Albany, to house the departments of education and science, one of the finest buildings, architecturally and otherwise, in the world. The cost of the building, exclusive of the grounds, was about \$4,500,000. The state geological survey and museum occupy an important part of the building. During the meeting of the Geological Society the formal opening of the museum took place. There were addresses by Governor Whitman and other public men, among them being Col. Roosevelt whose address was much enjoyed, at least by the Canadians present. The Colonel, while he said he was trying to give a scientific address, as befitted the occasion, did not neglect the opportunity to say what he thought of the action of certain of his countrymen during the Great War. He referred to the various collections in the museum, among them the beautiful exhibits of Indian life in the state, and showed how the Iroquois induced peace among the aborigines with benefit to all. Other exhibits were used to illustrate the same point. The Colonel's motto still appears to be the title of his book "Fear God and Take Your Own Part"—be loyal to the country to which you owe allegiance, no matter what your origin may have been, protect the weak and be prepared against aggression.

While many of the papers presented at the meetings of the Geological Society have little, if any, economic bearing, it is not safe to assume that they never will have. For instance, a few years ago glacial geology

might have been considered to be a purely abstract science, but at present use is made of it in studying clay, gravel and sand resources and even water supply. Similarly an academic study of volcanic deposits, unconformities, faults and other features, frequently leads to a better understanding of structural relations in mining areas and thus becomes of economic importance.

In addition to the numerous papers dealing with so-called pure science, there are presented at every meeting others on subjects such as ore deposits, which everyone recognizes as having a direct economic bearing.

There are two other societies of an international character in North America that deal with mining, namely, the Mining and Metallurgical Society of America, and the American Mining Congress. The membership of the former is much less than that of the American Institute of Mining Engineers and is restricted to men with special qualifications. The American Mining Congress does not insist on technical qualifications from candidates for membership, and its work is more especially concerned with legislation and other matters affecting the industry.

It may be added that the Canadian Mining Institute, whose annual meeting in March is looked forward to with increasing interest by its members, is also international as regards its membership, but it is essentially a Canadian society, supplementing the work, in the northern half of the continent, of the American Institute, and dealing, moreover, with problems that do not come within the latter's scope.

There was a good representation from Canada at the Albany meeting. From Ottawa came Messrs. Bancroft, Jr., Burling, Cairns, Johnston, Kindie and O'Neil, while Montreal was represented by Messrs. Adams, Bancroft, Sr., and Dresser; Kingston by Mr. Mather, and Toronto by Messrs. Coleman, Knight, Miller, Tyrrell and Walker. It may be added that the secretary of the Society is still marooned somewhere in the polar regions, and the members are greatly indebted to Professor Chas. P. Berkey of Columbia University who, in addition to his other onerous duties, has so efficiently performed the work of secretary in Dr. Hovey's absence. It was much regretted that Professor Kemp, who is so deservedly popular wherever he is known, was not present. Hope for his speedy recovery was expressed by all.

#### MURRAY-MOGRIDGE.

The stock of the Murray-Mogridge property is being offered for public subscription by J. M. Childerhose. This property is located at Wolf Lake in the township of Maisonneville, and three or four miles from Bourkes station.

A road has been cut from the railway for the hauling of supplies, and work is proceeding at the property where a small staff of men are employed and preparations are under way for extensive development.

The property is considered to be a promising prospect.

#### HOLLINGER.

By May or June this year the Hollinger should be treating about a hundred thousand tons of ore a month. The mill addition building has been completed and machinery is now being installed. There will be in the enlarged mill 200 stamps, 20 tube mills and a ball mill.



## SOME HISTORIC ROCK DRILLS

By H. B. Willmott\*

The subject of machine rock drilling for boring shot holes is one of leading importance to the mining engineer. With the old methods of hand mining, progress was laborious directly hard ground was encountered, and the output in any given case was always restricted, owing to the expensive and difficult conditions surrounding the sinking of shafts and the driving of drifts and raises. In the present condition of mining, when high grade ore bodies are few and far between, and when the future of the industry is essentially the working of low grade propositions and, consequently, the quick output of large tonnage, much ore mining would be commercially impracticable without

solid rock, and more recently, the 12 mile Simplon tunnel, and still more recently the Pennsylvania Railway Terminals at New York, the Mount Royal tunnel and the Rogers Pass tunnel, are notable examples. To these must be added numerous other important canal, tunnel, railway cuts, dock, harbor, sewage and other public works, where the rock drill has been employed, and without which the expense and difficulties would often have proven prohibitive. In quarrying also the present enormous output of dimension and road stone at low cost owes much to mechanical boring.

With the exception of the Simplon tunnel, and a few comparatively isolated instances, the whole of the



The Old Method

the aid of the rock drill, which bores its way through rock at the rate of hundreds of blows per minute, each harder than any blow possible by hand labor. In this as in most other mining operations, the days of competition between mechanical power and human muscle are over. It therefore may be safely said the rock drill has been the most important mechanical factor in the remarkable development of metalliferous mining to the present day.

To the civil engineer the subject is of equal importance. Many engineering schemes necessitating the removal of large quantities of hard rock, owe their successful completion to the assistance of the machine drill. The Mont Cenis and St. Gothard tunnels, respectively  $7\frac{1}{2}$  and  $9\frac{1}{4}$  miles long, the 34 mile Croton Aqueduct tunnel, the Chicago drainage canal, which involved the removal of fourteen million cubic yards of

world's machine drilling in hard rock, down to within the last few years, has practically been accomplished by means of striking or reciprocating machines, in which the drill bit is an extension of the piston rod, and is actuated by steam or compressed air.

The reciprocating machines of this earlier date were not by any means last. The Mont Cenis tunnel was perhaps the field where was solved the original problems of rock drill use. The tunnel was about eight miles long and was the first connecting link through the Alps of the French and Italian railway systems. From 1857 to 1861 the headings progressed at about the rate of eighteen inches per day. This was of course by hand labor, and using black blasting powder. When machine drills were introduced the speed of advance in each heading rose to nearly five feet in twenty-four hours, and when dynamite was introduced, to a little over six feet.

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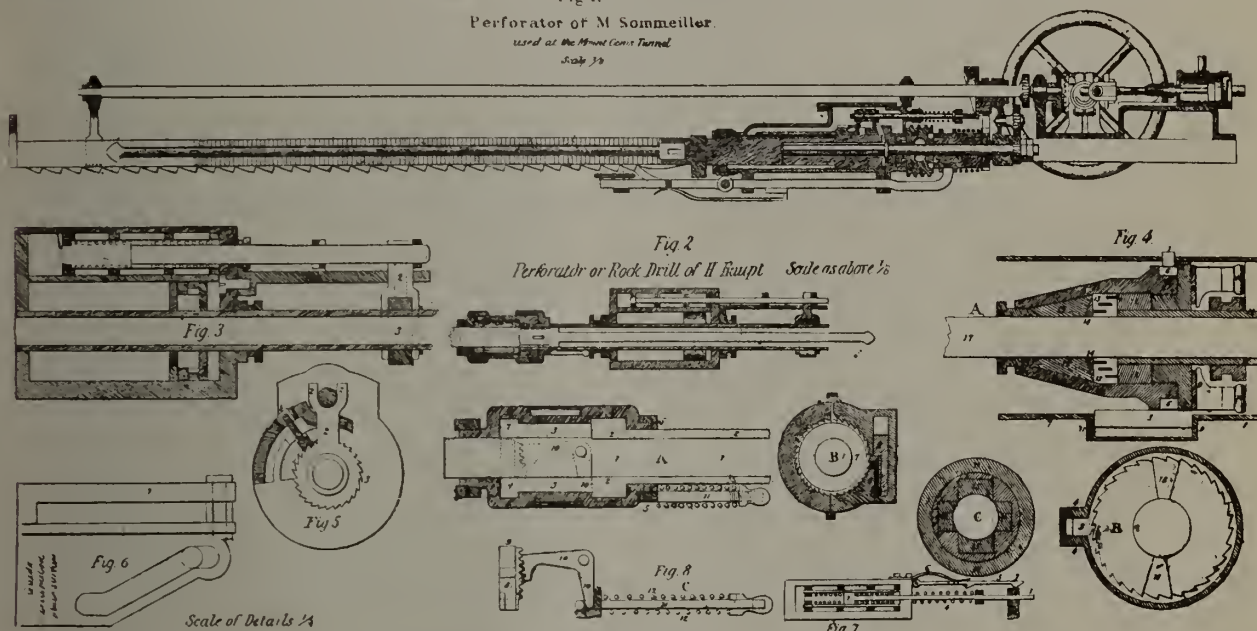
The history of rock drilling naturally commences with hand hammers, which have been used from time immemorial; the next step being perhaps lifting and dropping a weight in the manner still employed in pile driving, and subsequently early in the seventeenth century the employment of a trip hammer for holing. Only vertical holes, however, could be bored by this appliance.

The fluid driven drill did not arrive until the last century and many claims are made for its original invention. Thus in America it is decidedly an American idea, in Germany it is shown that its notion was Teutonic in its inception, whilst the French engineer would

probably refer to one of his own countrymen as its inventor. The English claim Richard Trevithick as being closely associated with the first rock drill, for in 1813 he mentions in his letters a machine which bored holes in Plymouth limestone five times as fast as hand labor. This, however, was a rotary machine. About 1842 the idea of fastening a bit to the piston rod of a cylinder was embodied in the invention of Nasmyth's steam hammer.

In 1849 J. J. Couch of Philadelphia invented the first percussion rock drill. This drill contained the principal mechanical features still found in piston drills. Fowle of Boston shortly after patented a rock

Fig 1.  
Perforator of M Sommeiller.  
used at the Mount Conn Tunnel.  
Scale 1/2"



Early Types



Old and New Methods of Drilling



drill which contained the idea of imparting a slow rotary movement to the reciprocating motion.

These early drills with their immediate successors were all steam driven. It was not until 1854 that drills were operated on air, when Bartlett's rock drill was tried out at the Mont Cenis tunnel.

Rock drills, however, were not used to any extent until many years had elapsed, as they were at that time heavy and cumbersome, and could only be practically used when mounted on a heavy carriage. Some of the difficulties encountered in the up-keep of these earlier drills may be gathered from the fact that at the Mont Cenis tunnel in 1867 no fewer than 200 Sommeiller machines were kept on hand to run sixteen constantly at work.

Couch and Fowle's patents of 1849 have been followed by the well known names of Doering, Wood and others, by whom the machines have been greatly improved, so that to-day we are getting from a dozen sources, high class rock drills, the splendid achievements of which have materially contributed towards civilization and progress.

In passing it may be mentioned, that for mining work, machine boring was early introduced into Cornwall, England, and it is worthy of note, that the rock drill has been in continuous use since 1867 up to the present day at the Dolcoath Mine.

In the early days of rock drilling in mining work, a water jet was considered a necessity, the method of obtaining this being by turning a connection from the air main into a closed cistern of water, a jet being forced out through a hose connection and directed to the mouth of the hole.

It was, however, not infrequently found that a ring of tenacious mud formed some distance inside the hole, causing difficulties and delays when withdrawing the bit; this, and the inconvenience of excessive watering resulted in the total disuse of the jet system.

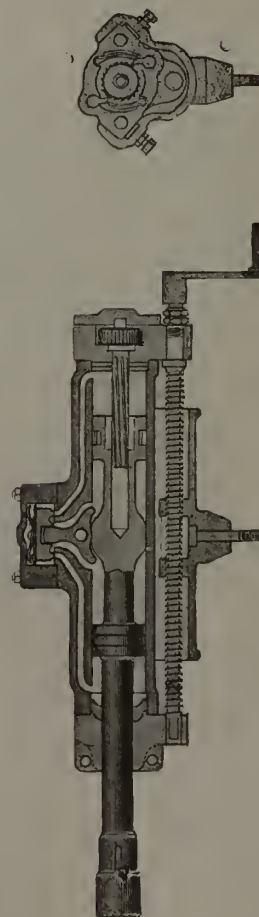
The spray system was then designed to allay the dust. This system while not popular is in more or less use in different parts of the world at the present time, more particularly perhaps, in connection with hammer drills.

The standard steam or air actuated rock drills gradually divided broadly in two classes according to valve gear, viz.: (a) the tappet type, in which a projection forming part of the reciprocating portion of the machine strikes the rocker arm or tappet, and moves a slide valve by direct contact, and (b) the fluid moved valve type, in which the piston itself, at certain points of its travel, admits a supply of fluid to move the valve, or to move the supplementary piston which in turn moves the valve.

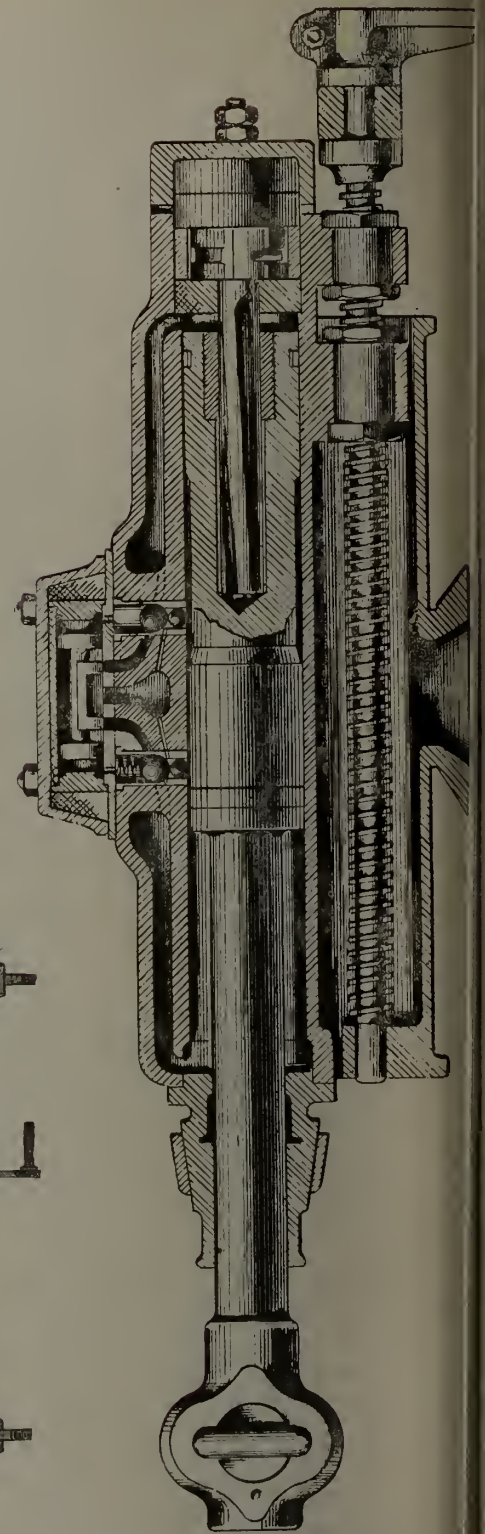
There is a third arrangement, which may be termed the valveless type, in which the moving piston acts as its own valve, as during its stroke it alternately opens and closes certain ports, so that the fluid acts on each end of the piston in turn. This arrangement is still found in several pneumatic tool drills, and in hammer rock drills, but has been discarded for piston drills since the Darlington drill of 1873. The general arrangements of the tappet and air thrown valve drills are shown in the following two cuts, so that a detailed description of the parts is unnecessary. The present day reciprocating type rock drill follows in all essentials the general plan of these older machines.

The following chronological table is an interesting compilation of some of the most important events concerning rock drills, boring shot holes, explosives and

Tappet Thrown Valve.



Fluid Moved Valve.





blasting ground. It was partly compiled by Rziha and Drinker and is supplemented with additional information.

A.D.

- 1280 Albert Magnus, the German friar, describes an explosive powder.
- 1280 Roger Bacon notices the composition of an explosive powder.
- 1324 Berthold Schwartz is said to have invented gunpowder.
- 1412 Gunpowder manufactured in England.
- 1613 Martin Weigel, mining superintendent of Freiberg, proposed drilling and blasting in mines.
- 1670 German miners introduced blasting into England.
- 1685 Tamping with clay known in Saxony.

- 1791 Le Plat used sand as a tamping.
- 1795 Humboldt proposed making the shot holes wider at the bottom (of a conical shape).
- 1811 Spangenberg of Sahl, used wooden tamping rods, also wooden needles and soft clay for tamping.
- 1813 Trevithick invented a rotating boring machine, which was made at Hayle Foundry, Cornwall, and put into operation at some limestone quarries near Plymouth.
- 1823 Harris fired a blast by the electric spark.
- 1829 Needles made of a composition of lead and tin used in the district of Ehrenfridersdorf.
- 1829 Moses Shaw of New York fired several charges of powder simultaneously by passing an electric spark through a priming composed of the fulminate of silver.

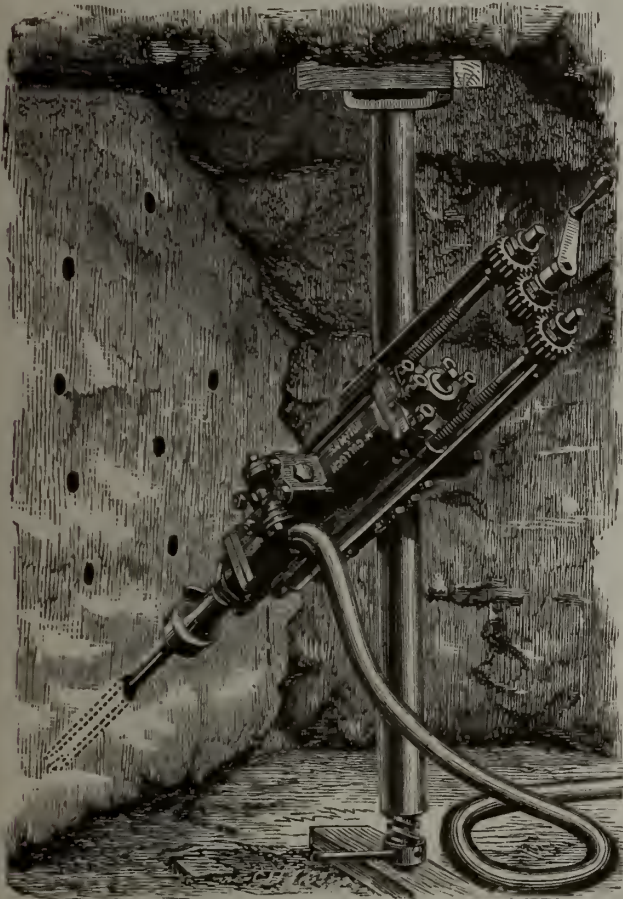


Fig. 11. Rock Drill in 1880.

- 1687 Lumbe introduced into the Harz, tamping with clay, and straws filled with powder for firing the shot holes.
- 1688 Singer of Clausthal employed small firing tubes of hard wood.
- 1689 Luft of Clausthal used paste-board cartridges.
- 1717 Fritsch proposed to save powder, and to break rock by wedges driven into the bore holes.
- 1725 At this date the simultaneous firing of several shots was known.
- 1749 Hungarian miners first introduced the chisel-bit drill into the Harz. For a period of one hundred and thirty-six years, from Weigal's day to this date, all drilling had been done by means of crown and cone "bits."
- 1759 Drilling with a chisel-bit introduced into Saxony.
- 1760 Thumberg introduced into Sweden tamping with wedges.

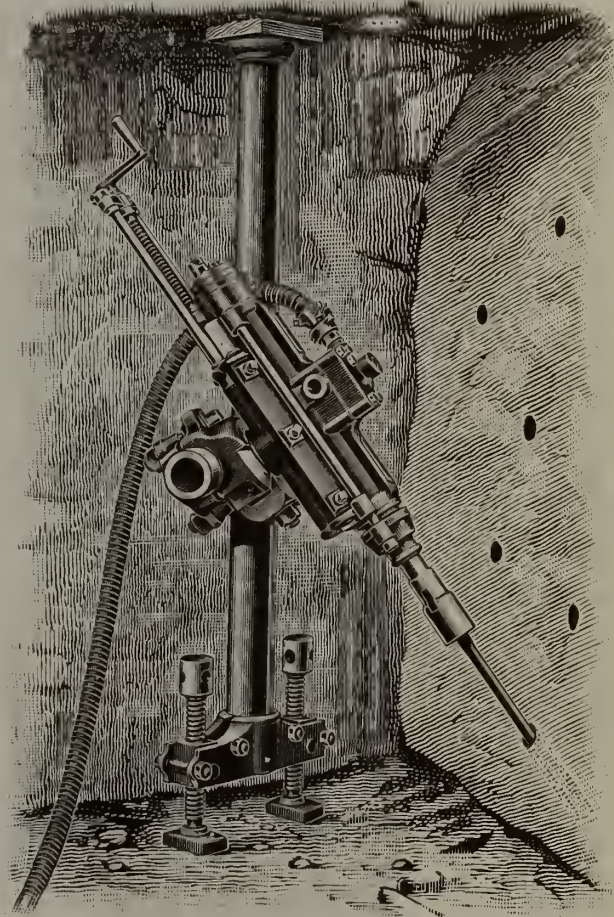


Fig. 12. Rock Drill in 1890.

- 1831 Bickford of Cambourne invented the safety fuse.
- 1834 Pischal proposed ignition of blasting powder by means of percussion.
- 1838 Prideaux used oxyhydrogen for deepening bore holes, and with it burnt a hole at the rate of one-eighth of an inch per minute.
- 1839 Hague injected water into air compressing cylinders.
- 1840 Bore holes made with rotary drills at Lankowily.
- 1840 Cast steel borers used in the Derbyshire mines.
- 1844 Brunton of Cornwall, proposed using compressed air for working drill hammers, the air after use to improve ventilation.
- 1845 Cast steel drills tested at Freiberg.
- 1846 Schonbein exhibited a sample of gun cotton at the British Association.
- 1847 Sobrero discovered nitro-glycerine.



- 1849 Randolph of Glasgow introduced into an air compressor, a spray of water for cooling the air during its compression.
- 1849 Couch of Philadelphia patented a "lance" percussion drill.
- 1850 Robert Hunt, E.R.S., made low tension electric fuses and used them in sinking a pit at the Abercarn Colliery, South Wales, the firing of the fuses having been performed by means of an electric battery. The holes were bored in one operation, and fired simultaneously in volleys. The holes were placed so as to obtain a "sink" of ground from the blast.
- 1861 On the first of January, Sommeiller's perfected drill commenced to work at the Mont Cenis tunnel.
- 1861 Lisbet applied his boring machine in soft rock (coal, soft limestone, etc.)
- 1862 Bornhardt's air-tight electric firing machine brought into successful use.
- 1863 Edward Crease introduced his rock boring machine into the Clogau Mines, North Wales.
- 1863 Lowe rock drill invented.
- 1863 Sach's rock drill invented.
- 1863 Nobel applied nitro-glycerine as a blasting agent.



Rock Drill fitted With Spray Attachment

- 1851 Fowle of Philadelphia patented a direct action percussion drill.
- 1851 Cave of Paris invented a reciprocating percussion drill.
- 1853 Piatti proposed using compressed air in the construction of the Mont Cenis tunnel.
- 1854 Bartlett's rock drill tried at the Mont Cenis tunnel.
- 1854 Schumann invented his percussion power drill.
- 1857 Schumann's drill employed in the Frieberg mines.
- 1857 Sommeiller invented a drill for use in the Mont Cenis tunnel.
- 1857 Ebner employed a frictional machine for blasting.
- 1857 Schwarznkopf's drill tried at Bingen.
- 1864 In March, Carl Sach's machine introduced in the Altenberg Mines, Aix-la-Chapelle.
- 1865 Gun cotton tried at Hoosac tunnel.
- 1866 Lithofracteur manufactured by Ergels near Cologne.
- 1866 Nitro-glycerine tried with great success in the Hoosac tunnel.
- 1866 Jordan and Darlington invented the rifle-bar and ratchet wheel for turning the piston carrying the drill.
- 1866 The Burleigh drill successfully introduced at the Hoosac tunnel.



- 1867 Jordan & Darlington invented the straight and spiral shot, and double ratchet wheel for turning the drill.
- 1867 Dynamite patented in England.
- 1867 Doering introduced his boring machine into the Tincroft Mines.
- 1867 Dubois & Francois rock drill invented.
- 1870 Beaumont & Appleby's diamond boring machinery introduced at the Croesor United Slate Quarries, North Wales.
- 1870 Sir George Denys. Bart., commenced driving an adit for the Old Gang Company, Yorkshire, by means of the McKean drills.
- 1873 The Ferroux rock drill invented.



A Piston Drill at Work in an 18-inch Stope

- 1873 The Darlington rock drill invented.
- 1874 The Mowbray mica powder patented.
- 1874 Electric blasting introduced by Darlington into the Minera Mines; Bonhardt's machines, the blasting stick, and wire electric fuses being employed for that purpose.
- 1874 Darlington invented the spinning piston.
- 1876 The Beaumont rock drill employed at Carn Brea.

The last forty years have been marked by brilliant achievement in almost every department to which the admirably compiled table refers. In rock drills, particularly, enormous strides have been made: Since 1876 other well known names have followed from practically

every quarter of the globe. The long list of inventions, which in the present instance is simply hinted at, has greatly improved the rock drill, until to-day the great mining camps all over the world have high class machines, each contending for supremacy. In addition to the steam and air actuated piston drills, we have the electric drills, hydraulic drills, gasoline drills, hammer drills, and well drills. In concluding the table, however, the following events are probably worthy of note: 1879 Rock drills made at the Camborne Engineering Works—now Holman Bros.

1903 Air hammer rock drills first used.

1908 The world's record for incline shaft sinking made in South Africa.

1909 The world's record for driving made in South Africa.

1914 The world's record for tunnel driving made at Montreal, Canada.

The reciprocating rock drill to-day is a vastly improved machine over those used in the past. Not only are rock drills mechanically better but they are structurally better, and doubtless, as the years go by, further improvements will be made, until at last the "perfect machine" is achieved.

In closing, acknowledgment should be made to Messrs. Holman Brothers of Camborne, England, manufacturers of the well known line of Holman Rock Drills, for the cuts given herewith, and for a great deal of the information contained.

#### PLENAURUM.

It was announced at the meeting of McIntyre shareholders, held in Toronto on December 28, that a year's option has been secured on the Plenaureum property, which adjoins the Jupiter on the east. Although the terms of the option have not been announced, it was stated that the McIntyre was to spend \$53,000 on the property within a year, for which it would receive stock in the Plenaureum company.

#### ACCIDENTS AT PORCUPINE.

Timmins. Jan. 4.—Wednesday of last week was "accident day" in the Porcupine Camp, no less than three serious accidents occurring and two deaths resulting.

Wednesday morning, at an early hour Geo. Mudato, a Russian, was blown to pieces at the Hollinger mine. Toni Mascioli, an Italian, who was working with him in the blasting operations, also received a bad shaking up, but was not seriously injured.

#### THE DOME MILL.

The present plan of mill extension at Dome Mines now gradually being carried out is the substitution of ball mills for stamps. There are now two ball mills and sixty stamps working, which can easily give a combined capacity of fifteen hundred tons a day. The sliming capacity of the mill does not exceed that, so until other sections than crushing have been enlarged there will be little change in mill capacity. It is proposed to instal five ball mills, each having a capacity of about five hundred tons a day.

#### SCHUMACHER.

Like most of the mines in Porcupine, the Schumacher is figuring on mill expansion. The mill, now treating about a hundred and forty tons a day, will be increased to 300 tons, and stock has been issued to cover the expenditure.



## ROCK DRILLS

By M. M. Morrison.

The relative merits of rock drills are usually based on drilling speed, freedom of rotation and reciprocation, and the time required to change drills.

Drilling speed being the chief aim, the drill steel should be as small in cross section as the service will permit. Within economical and practical limits, a light drill will drill faster than a heavy one by reason of lower resistance to acceleration. Other things being equal, the drilling speeds of drills having bits of different diameters will vary inversely as the areas of the holes drilled. The smaller steel costs less per foot, is easier to carry, and does not break as frequently as steel of larger diameter.

The time devoted to actual drilling of the daily quota of holes for blasting is but one of several items that enter into the cost of mining. It may constitute a higher percentage of cost in some mines than in others and routine and appliances well suited to one mine may not be so well adapted for a different rock formation and different conditions. The hardness and abrasive qualities of rock formations differ, and while a blunt, obtuse bit may be the best form for drilling a hard, brittle formation, a sharper, or less obtuse bit may drill faster in softer, more tenacious rock, especially if it contains a calcareous, or other binding element that imparts a tendency to pack under pressure.

Machinists find it profitable to grind their cutting tools at different angles for cutting different qualities of metal; so too, the mine manager may find it profitable to determine, by trial and observation, the bit angles best suited for his rock formation.

With a view to maintaining the diameter of the hole as nearly uniform, from start to finish, as may be economically practical, the outer corners of the vanes and the reaming shoulders should be the same radial distance from the centre, so that all that the cutting portion of the vanes will cut and ream in the same circle.

Since the corners of the forward cutting edge cut around the longer circumference they will be worn the most, and when they are much worn it will economize drilling time to replace the drill by a sharp one, of the same gauge, or a trifle smaller. The depth to which a drill will penetrate economically should determine the "run" or difference in length of successive drills.

A drill that is fit to use will drill a hole that is a little larger than the diameter of the bit, probably due to the abrasive action of the sludge, and the quivering of the bit against the sides of the hole. This slight clearance permits the drill to rotate and reciprocate with sufficient freedom.

By reason of greater flexibility the smaller steel will rotate more freely in a hole that is not absolutely straight, and will bend to a sharper angle without breaking.

### HUNTON-KIRKLAND LAKE.

It is reported that work is to be resumed on the Hunton-Kirkland Gold Mines property early this year. This was considered one of the most promising of the Kirkland Lake prospects at one time, and comprises about 40 acres lying close to the principal producers of the Camp.

### McINTYRE.

Shareholders of the McIntyre, Extension and Jupiter companies have ratified the amalgamation of the three properties.

## NORTHERN ONTARIO MINES IN 1916

The following review of progress in Northern Ontario during the past year is from Gibson's "Fortnightly Review":

**Porcupine.**—Looking back over the past year one can see momentous changes in Porcupine, and it needs no stretch of the imagination to say that all of these changes have been made for the better.

Without exception, those mines which were being operated a year ago are now in better physical condition than at that time. Production has increased at a most satisfactory rate, and additions to mining and milling plants now being installed make certain still further increases in months to come.

The startling feature of the enlargement of activities in the camp during the year, however, is that of the greater number of properties now being developed. Many prospects of certain promise, which a year ago were idle, are now being energetically and intelligently operated, and it would appear reasonably certain that new producers of wealth will be added to the already respectable list.

A confidence, born of certain knowledge that the extent of Porcupine's mineral wealth is as yet entirely unknown, is part of the make-up of every person acquainted with conditions there, and that such confidence has not been ill-founded in the past gives ground for the belief that such will be equally well founded as regards the future.

During the year the camp has attracted the attention of outside capital to an extent before unknown, and the indications of a continuance of such a flow of capital into new ventures during the coming year would appear very bright indeed.

The almost unexampled prosperity of both the United States and Canada, together with the success that has attended operations on the better known Porcupine properties are factors that must have a large influence. That operations on properties recently refinanced and on which operations have been recently or are about to be resumed are almost entirely on those which can be considered to "have a chance" is also worthy of comment. Wild-catting, beyond an occasional example of a sky-rocketing stock market in certain new issues, is conspicuous by its absence.

**Cobalt.**—In spite of many predictions that Cobalt was approaching the end, progress can be noted here. The year 1915 was indeed an unsatisfactory one from the standpoint of the producers of silver metal, and even at the beginning of the present year matters were in such a state that no wild enthusiasm could be noted in the attitude of the operators of properties there.

Early in the year, however, an improvement in the price for silver metal caused a more optimistic frame of mind to come into being, and when, in May, the price reached 77 1-4c per ounce, a figure never before realized in the history of the camp, an impetus was given to production and development that has since had a decided effect.

The adoption of the oil flotation process of treatment of ores bids fair to add years to the life of the camp, for the reason that this method allows the handling of the very low grade ores that under former methods were necessarily treated as a waste product. This method has even made it possible to re-treat the large tailings dumps which had accumulated in past years of operations. These are known to contain millions of ounces of silver, which, with present prices for the metal and more scientific methods of treatment can be handled profitably, and thus add largely to the total of production from the district.



The high average price for silver that has prevailed during the year has made it possible for the production of the camp, although smaller in point of silver ounces, to exceed in value that of any recent previous year. Although the cost per ounce of production will probably average higher than heretofore on account of labor conditions and the high cost of mining supplies generally, such increases are very much more than offset by the better price, so that the percentage of profits to production will no doubt exceed that of any previous year in the camp's history.

The success that has attended the later operations in the Southeastern Coleman section of the field, notably at Beaver and Temiskaming, has given an impetus to development in that section. With that section, because of the geological conditions which prevail, would seem to rest the probability of a continuance of Cobalt's wonderful production of the white metal.

To us it appears that the most important single development now taking place in the camp is the effort being made by the Beaver and Temiskaming companies to prove the existence of values at the lower or second contact. This effort has required the expenditure of an enormous amount of money in sinking two shafts to a depth of 1 600 feet, where development is now actually proceeding.

The courage shown by those responsible for this development carried out to prove or disprove what is conceded to be a logical theory, is to be commended, and it is particularly gratifying to all who have the best interests of the camp at heart to know that, although no commercial silver values have as yet been demonstrated to exist at this great depth, geological conditions have been proven to be almost identical to those which prevail at the upper contact. It would seem reasonable, therefore, to expect success to crown this effort during the year 1917.

The most graphic illustration of the real success that has attended operations during the year, however, is given in the disbursement of extra dividends by several of the operating companies and the resumption of such disbursements by other companies who had suspended dividend payments since 1914.

In spite of these added payments, the surpluses now being carried by many of the producing companies now stand at record levels, foreshadowing still further heavy distributions. Such a condition must be conceded to be a most satisfactory one, and it would seem therefore that the full tale of Cobalt's wonderful wealth is as yet far from told.

**Kirkland Lake.**—Second only to Porcupine, the development of this field has made progress during the year. It may even be safely said that this camp has outdone Porcupine in the number of properties that have passed from the stage of raw prospect to that of proven mines, only awaiting the installation of milling machinery to make production a reality.

The Tough-Oakes, on which development has been carried farthest, has been a profit-maker from the "grass roots," and is now paying dividends at the rate of 10 per cent. annually. The unfortunate litigation in which some of the larger interests have been involved for several years, however, must have had its effect on the proper development of the mine, as the management cannot have been free to carry out their ideas under such a handicap. It is to be hoped for the good of the property and of the district generally that these conflicting interests can be gotten together.

The Teck-Junges now only awaits the advent of electrical power to begin milling the ore that has been de-

veloped since it has been handled by the present interests. Thus the next sixty days should see this company definitely embarked on a producing career.

The Lake Shore, McKane and La Belle have also now reached the stage of reasonable certainty, and announcements that milling plants are to be erected on one or more of them would not come unexpectedly. The Wright-Hargraves, on which development was recently resumed, also gives great promise, so that it would appear safe to say that Kirkland Lake now has six proven mines, with excellent prospects for three or four more which are located on the belt.

**Other Districts.**—The stick-to-it-iveness that certain owners in the Gowganda and Miller Lake fields have shown has been rewarded during the year by very favorable results, which lead to the hope that these districts are about to "come back." Notable among these are the Miller Lake-O'Brien, where a short time ago what is conceded to be the richest deposit of high-grade silver ore ever opened up in the north country was encountered. Although handicapped by lack of proper power and transportation facilities, development has proceeded without interruption for several years, and it now bids fair to become one of the big silver producers of the north.

The Reeves-Dobie, at Gowganda, after a somewhat checkered career, lately shipped about eleven tons of ore, which gave returns of \$57,000 at the smelter. In point of values per ton, therefore, this is one of the richest shipments that ever left the north.

The knowledge that several strong companies are financed to carry out extensive development of promising properties in the South Lorrain, Munro Township, Boston Creek, Tashota and West Shining Tree districts, leads to the hope that 1917 will see new fields under energetic development. This, in our opinion, is all that is needed to bring the great north country into its own.

It is certain that mining in Northern Ontario was never before on such a solid foundation as at the end of 1916.

### BOSTON CREEK.

Timmins, Jan. 4.—The two compressors at the Boston Creek mine are now in position and will greatly augment mining operations at that property. Work to date has been carried on through the shaft of the R. A. P. Syndicate, but the connection of the raise from the drift at the two-hundred foot level will now facilitate future developments.

### THE McINTYRE MILL.

During 1916 milling capacity at the McIntyre was increased from an average of 290 tons per day to about five hundred tons a day at the close of the year. This increase was brought about by the addition of a unit of ball and pebble mills and an auxiliary ball mill. It is quite likely that more units will be installed during 1917.

The Pas, Man., Dec. 22.—Henry McCafferty arrived in town on Sunday's Muskeg after the completed camps at the Rex mine, Herh lake. He has freighted into the mine thirty tons of machinery and supplies. He reported the vein on the property was showing up well. The head-frame, hoist and shaft-house are now completed, and everything is ready to continue sinking the shaft as soon as the miners arrive from The Pas.



### UNIVERSITY PROFESSORS LECTURE ON MINERALS.

The Pas, Man., Dec. 15.—A real event in the history of The Pas was the course of lectures delivered at the Central school during the past week by Professors Wallace and DeLury of the University of Manitoba, on mining, mineralogy, prospecting and matters pertaining thereto.

These gentlemen arrived last Saturday morning and immediately set up their equipment in the school house. That evening Professor Wallace delivered a lecture on "Manitoba in the Making." It was illustrated by lantern slides and proved exceedingly interesting, as well as instructive. Dr. Wallace discussed the general structure of that part of North American continent in which Manitoba is situate, showed the various geological developments that had taken place, and indicated the present structure of the province, and particularly of this northern part. The lantern slides certainly added much to the way of bringing clearly before those in attendance the points referred to by the speaker. At this lecture the program for the week was announced.

The professors offered during the days following to give instruction to any of those interested in prospecting and mining work. This instruction was entirely informal, the main work being examination of a large number of specimens which the professors brought with them and discussion incident thereto.

On Monday evening Dr. Wallace, in a general lecture, told of the different mining fields in Manitoba. As he had examined these personally he was in a position to give accurate information. As in the preceding lecture, this was illustrated by lantern slides. There are three mining districts in Manitoba, Star lake, Rice lake, and the country north of this point. The last mentioned has much the largest territory, although, up to date, possibly more has been expended in development in one of the other districts. The lecturer pointed out that the discoveries made in The Pas district covered a large area, and were such as would in all possibility change this order before very long.

Professor DeLury was in charge on Tuesday and Wednesday evenings, during which time he took up the systematic study of the general formation of the rocks composing the earth's crust; how they became mineralized, and the main character of the different minerals. These lectures were also illustrated by both lantern slides and samples of different rocks which were on hand. After the lectures each evening there was a free discussion on any matters which those in attendance cared to take up.

In the final lecture on Thursday evening, Dr. Wallace took for his subject that very interesting topic "Gold." This proved to be a very fitting wind-up to a most interesting and satisfying series.

The thanks of the people of The Pas and the north country generally, are due to these gentlemen for their trouble in coming here at this time. Some of the mining men from the various districts to the north came in to hear the lectures and expressed themselves as having been greatly benefited thereby. These lectures are an indication of what the University can do in a practical way to help in the legitimate development of the country.

### IRON AND STEEL PRICES.

"Opinion is gaining strength," Iron Age hears from Pittsburgh, "that top prices have been reached in the steel and iron market."

### UTILIZING WASTE HEAT FROM REFINING FURNACES.

The International Nickel Company (Orford Copper Works) has in service over 3,000 h.p. of waste-heat boilers set in connection with nickel-refining furnaces. As in the case of zinc furnaces the temperature of the waste gases is high. While it varies during different portions of the operation, the average is probably in the neighborhood of 1,700 deg. when leaving the furnace. The boilers at this plant are of practically standard design, such as used for coal fuel, insofar as baffle arrangement is concerned. No complete test figures are available, but from data at hand the boilers are developing over 90 per cent. of their rated capacity with exit gas temperatures of approximately 600 deg. With such a temperature leaving the boiler and a draft resistance through the boiler corresponding to about rating in coal-fired practice, the low draft requirement at the furnace exit is readily met by a 100-ft. stack.

These boilers, as stated, are of practically standard design. As compared with the exit temperature of 600 deg. actually being obtained it would be entirely possible, with the modern type of waste-heat boiler, to reduce this to 450 deg., corresponding to an increase of over 13 per cent. in capacity. On the other hand, the design of boiler in use is developing approximately its rated capacity with gases that previous to 1911, the date of the first installation, were wasted. The success of the first units installed was such as to cause this company to duplicate them in later installations, and since these waste-heat boilers have made it possible to shut down a large portion of the coal-fired boiler plant, there was no apparent reason for changing the first design.

In this class of work, as with copper-refining furnaces, the saving due to the reclamation of dust, within the setting is an item that compares favorably with the saving due to the steam generated from the waste gases.—Met. and Chem. Eng.

### DOMES MINES.

In the month of December, Dome Mines milled 39 000 tons of ore and produced \$133,300 worth of bullion. The tonnage treated has been exceeded in only three months previously and values were higher in only two months of the year. The most interesting feature of the Dome statement is that the total cost per ton was reduced eleven cents. This in face of the continued high cost of mining materials is rather a surprise. The average value per ton was \$4.70, which is higher than for any month since July and about the average of the year.

Figures for the twelve months of last year compare as follows:

| 1916 Month. | Tons milled. | Bullion produced. | Value per ton. | Total cost per ton. |
|-------------|--------------|-------------------|----------------|---------------------|
| Jan. ....   | 31,600       | \$175,639         | \$5.558        | \$2.77              |
| Feb. ....   | 32,040       | 164,037           | 5.119          | 2.71                |
| March ....  | 34,300       | 173,724           | 5.064          | 2.64                |
| April ....  | 37,300       | 177,624           | 4.762          | 2.40                |
| May ....    | 39,400       | 190,229           | 4.828          | 2.44                |
| June ....   | 36,700       | 179,245           | 4.883          | 2.66                |
| July ....   | 38,150       | 179,370           | 4.701          | 2.57                |
| Aug. ....   | 40,010       | 179,530           | 4.487          | 2.55                |
| Sept. ....  | 38,300       | 179,500           | 4.686          | 2.59                |
| Oct. ....   | 40,200       | 185,000           | 4.601          | 2.69                |
| Nov. ....   | 37,900       | 177,000           | 4.670          | 2.88                |
| Dec. ....   | 39,000       | 183,300           | 4.700          | 2.77                |



## PERSONAL

Mr. Harry Sparks, who has been assisting Mr. Julius Cohen at the Croesus Mine, is in the Shining Tree district in charge of the operations at the Caswell property, for the owners of the Croesus.

Mr. J. B. Tyrrell has returned to Toronto from British Columbia.

Mr. Clyde Weed has been appointed general manager of the Lake Copper Mining Co., Michigan.

Mr. Frank Oliver, Toronto, has been elected a member of the Canadian Mining Institute.

Mr. W. E. Segsworth, Toronto, has been chosen to represent the Toronto branch of the Canadian Mining Institute on a committee recently organized in Toronto to assist the Government in utilizing the services of technical men in carrying on the war.

Dr. W. G. Miller, Mr. C. W. Knight and Mr. J. B. Tyrrell have returned to Toronto after attending the annual meeting of the Geological Society of America.

Mr. E. V. Neelands has resigned as general manager of the British Guiana Gold Concessions Co.

Mr. H. M. Porteous is now manager of the Burnt Hill tungsten mines, Maple Grove, N.B.

Mr. George G. Thomas, has resigned as manager of the Dome Lake in Porepine and the Hudson Bay in Cobalt. He will open an office in Toronto as consulting engineer. Mr. Thomas will act as consulting engineer for the Calumet and Montana Company in Cobalt, the Murray Mowgridge Company at Wolfe Lake and the Comstock. He is succeeded by Mr. H. W. Darling of the Porepine Crown as manager of the Dome Lake and Mr. Douglas Much, assistant manager of the Dome Lake, as manager of the Hudson Bay in Cobalt.

Mr. George H. Williams, who was construction engineer in charge of the erection and equipment of the smelting works at Crofton and Ladysmith, Vancouver Island, British Columbia, the former for the Northwestern Smelting Co., and the latter for the Tyee Copper Co., and afterward superintendent of the British Columbia Copper Co's smeltery at Greenwood, Boundary district, has gone to Chuquicamata, South America, from Anaconda, Montana, at which last mentioned place he was with the Anaconda Copper Mining Co.

Mr. Herman C. Bellinger of Spokane, Washington, for more than ten years actively connected with copper smelting in British Columbia, has been appointed general manager for the Chile Exploration Co., Chuquicamata, Chile. He was metallurgist for the late F. August Heinze when the latter in the nineties was operating the smelting works at Trail, B.C., afterward sold to Canadian Pacific Railway Co. interests which organized what is now the Consolidated Mining and Smelting Company of Canada. Later Mr. Bellinger was associated with Mr. James Breen in the establishment and operation of the Northwestern Smelting Co's smelting works at Crofton, Vancouver Island, B.C. Still later, he was general manager for the Cobar Copper Co., with big mines and smelting works in New South Wales, Australia. In quite recent years he has been consulting engineer in South America, where he is now continuing his work but in the capacity of general manager.

Mr. G. S. Rice, of the United States Bureau of Mines, has returned to Washington, D.C., whence he will send to the Minister of Mines for British Columbia his report on the mines of the Crow's Nest Pass Coal

Co., at Coal Creek, Southeast Kootenay, B.C., in which a succession of "bumps" lately wrecked a considerable area of the company's No. 1 East mine and had previously done damage in other parts of the property. Mr. Rice was assisted in his investigations by Mr. Wm. Fleet Robertson, Provincial Mineralogist, and Mr. Thomas Graham, Chief Inspector of Mines, for British Columbia. On Mr. Rice's report will be based the decision of the Department of Mines as to what part of the mines affected by the "bumps" will be declared unsafe for further working and consequently be permanently closed.

Mr. F. P. Burrall, mining engineer, New York City, who has for some time been engaged in professional work in mines in the neighborhood of Dawson, Yukon Territory, left that region early in December to spend the winter "on the outside."

Mr. James Cronin, for many years managing mines in British Columbia, went from the Babine country, in Omineca division of that province, to Spokane, Washington, last month to spend the Christmas season at his home there.

Messrs. Robert R. Hedley and S. J. Castleman were members of a party from Vancouver, B.C., which last month visited the Ikeda copper mine, on Moresby island of the Queen Charlotte group, on the coast of British Columbia.

Mr. W. E. Zwick, of Kaslo, B.C., went to Butte, Montana, last month. It is stated that he intended to endeavor to interest Montana men in the Cork-Province silver-lead mines, a promising group situated on the south fork of Kaslo creek, in Ainsworth division of British Columbia.

Messrs. P. W. Clark and J. Bresnahan, of the Galena Farm silver-lead zinc mine, near Silverton, Sloean lake, B.C., were in Nelson on December 20 on their way to Spokane to spend Christmas in that city.

Mr. Alfred McMillan, formerly of Rossland, B.C., and afterward for several years in charge of the Northport Smelting and Refining Co's inoperative smelting works at Northport, Washington, went to New York City in December in connection with a move to interest United States capitalists in the Velvet mine, about a dozen miles southwest of Rossland. The mine is owned in England, but has been operated on a small scale lately under lease and option of purchase.

### APEX.

The shaft on the Apex property which had been sunk to a depth of 90 feet by the old management, has been dewatered, and sinking has been started. It is the intention to continue this shaft to a depth of 300 feet, from which level lateral work will be done. A contract for 5,000 feet of diamond drilling has been let, and a start already made on this contract. Mr. W. J. Trethewey is in charge.

### PORCUPINE CROWN.

The discovery of good ore between the 800 and 900 foot levels has greatly improved the position of the Porcupine Crown company. Early in the year results of development were rather disappointing; but the mine is again in good shape.

### NORTH THOMPSON.

Ore from the North Thompson mine, Porcupine district, is now being treated at the Vipond mill. The properties adjoin and a satisfactory working agreement should be possible.



## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA

While it is not practicable, in the absence of returns from many of the larger producers of mineral, to make a definite statement as to the total value of the mineral production of the year 1916, there does not seem to be room for doubt that it will be found to be fully 50 per cent. larger than that of the year 1915 and probably nearly 40 per cent. greater than that of 1912, the year of highest record until 1916. Roughly, a total of about \$45,000,000 is estimated, and of this comparatively large amount somewhere about \$35,000,000 will be the value of the metalliferous minerals and the remaining \$10,000,000 that of coal and coke and miscellaneous products. The outstanding feature of the year's production is that of copper, which in both quantity and value will be found to have considerably exceeded that of any other of the twenty years that have elapsed since the production of this metal commenced to be of importance in the province. Next to copper, coal and coke make a good showing, with a total value of approximately \$8,800,000, which is an increase over the value of the output of those minerals in either 1915 or 1914.

#### WEST KOOTENAY.

Ainsworth.—Several mines have been continuing to ship ore notwithstanding that with the coming in of the winter season it is less easy to transport ore than either after the snow on the roads or trails shall have been well packed down, or in the summer, when the hauling by horse-wagon is good. The present largest shipper in this division is the Bluebell, which being situated near the lake-shore has no freighting difficulties to provide against as the seasons change. The Highland sends its ore down to the lakeside over an aerial tramway, so is also comparatively free from hauling troubles. Other shippers from the neighborhood of Kootenay lake are the Comfort and the Banker-Maestro group, the latter having resumed production after two years of inactivity. In the western part of the division, the Utica continues on the shipping list, and the Charleston and Whitewater (Retallack & Co's mine) each made a small shipment lately.

Slocan.—The Galena Farm, Rambler-Cariboo, Ruth, and Standard, have maintained an output of silver-lead ore, and the Hewitt, Idaho-Alamo, Lucky Thought, Queen Bess, Sovereign, Slocan Star, and Wonderful have made occasional shipments. The Lucky Jim has been for several months a regular shipper of zinc concentrate to the Trail smeltery, and the Galena Farm, Rambler-Cariboo, and Standard have shipped much zinc concentrate to the United States.

Nelson.—The Eureka copper mine shipped ore to Trail about the middle of December after a suspension of production of three months' duration. The mine is now being worked by the company owning it, the syndicate that for some time previously operated it under lease and bond having relinquished possession. The Granite-Poorman has been milling gold ore and, as well, doing underground development to gain depth on the Hardscrabble vein. The California, near the town of Nelson, has been shipping ore to Trail lately. The Molly Gibson, at the head of Kokanee creek, has been closed for the winter, the snow being too deep for advantageous working. The Jennie Bell, near Ymir, recently made a small first shipment to Trail. The Yankee Girl, also near Ymir, is reported

to have opened a new shoot of ore at considerable depth. The Emerald, near Salmo, sent 339 tons of lead ore to Trail during three weeks in December, after a temporary suspension of output, probably caused by bad roads for hauling.

Rossland.—Late in December it was announced that the Consolidated Co. intended to resume shipment of ore from its Centre Star group and Le Roi mines, after a short period of non-production, the result of coke shortage at the smelting works at Trail. The Josie group, of the Le Roi No. 2, Limited, continued shipping without intermission. This company's managers at Rossland reported to the London office for October, as follows: Josie mine shipped to Trail 1,511 tons of ore. Receipts from the smeltery were \$24,554, in payment for 1,768 tons of ore; sundry receipts were \$561; total of receipts \$25,115. Estimated working costs for the corresponding period were \$9,000 for ore production. Other expenditures were: On capital account, \$139; on development (including diamond drilling) \$9,770. Total expenditures, \$18,909.

#### VANCOUVER ISLAND.

The first coal shipped from the newly opened mine of the Nanoose or West Wellington Collieries, situated ten or twelve miles north of Nanaimo, was taken by scow to Vancouver city late in December. A shaft has been sunk and at a depth of about 130 ft. it reached the coal, which is the old Wellington seam there four feet six inches in thickness.

The Canadian Collieries (Dunsmuir) Limited, being short of men to work in its coal mines on Vancouver island, recently communicated with the City of Victoria Municipal Labor Bureau, as follows: We have vacancies for a considerable number of good, practical coal miners. The tonnage price for mining the coal is 82 1-2 cents; a miner doing company work or paid by the day, receives \$3.45. Timber men receive \$3.45, drivers \$3.15, leaders \$3.15, pushers 2.87 1-2. Board and lodging which is not included, runs from \$27 to \$30 a month at hotels and private boarding houses. The employment is steady; the transportation charges are not paid by the company."

#### OMINECA MINING DIVISION.

Interviewed at Winnipeg, Manitoba, Mr. W. P. Hinton, traffic manager for the Grand Trunk Pacific Railway, is reported to have said: "Central British Columbia, along the line of the Grand Trunk Pacific railway, is an especially promising field, the big mining interests of the United States having been attracted, notably to the Telkwa and Hazelton districts during the past year, and from the preliminary development in hand and the experience of actual shipping mines, a fair conclusion would be that in the comparatively limited Telkwa and Hazelton region, exploration so far shows that the copper area is at least as large as and is much richer than, the Montana copper field. In addition to this, valuable coking-coal areas have been discovered in the same region, and this is sure to be of untold benefit to the development of that part of the province, inasmuch as there are no copper fields in the world of any extent possessing the right kind of coal for smelting purposes in the same area. This mining development will encourage further settlement of the millions of acres of first-class agricultural land in the Bulkley and Nechaco valleys."



### ATLIN MINING DIVISION.

Concerning Atlin, the Whitehorse Star said recently: "Despite the shortage of labor in Atlin mining district the gold output for the 1916 season has been greater than for any year since the big rush in 1898. Efficiency has been greatly hampered this year because of the fact that many of the experienced hydraulic men have enlisted for war service and new men have had to be trained to take their places, thus causing a serious loss to operators. Notwithstanding this, however, everyone in the district prospered last season. Things have been on the upgrade since the summer of 1913. In that year the minimum of output was reached since the days of discovery. It took a good deal of optimism to hold through the lean years, but those who did are now repaid. Three rediscoveries were made last summer. On one creek there were no less than twenty small operators at work, and all were making money. Quartz operations will be begun on a large scale next year if the people interested can obtain facilities for treating their ore." While part of the foregoing is probably quite justified by the 1916 season's results, the writer of it does not seem too well informed as to production from Atlin creeks. Official records give \$75,000 for 1898, \$800,000 for 1899, and totals varying from \$530,000 in 1904 down to \$200,000 in 1909, that year having been the lowest on record. Thereafter there was a gradual increase, to \$315,000 in 1913 and to \$377,000 in 1915.

It is stated that during a recent month United States Consul Alger, of Fernie, Crowsnest district, Southeast Kootenay, passed through his office records of 75 ears of lead bullion shipped by the Consolidated Mining and Smelting Company of Canada, Limited, from its works at Trail, West Kootenay, to the East Chicago refinery, Illinois, the contents of those ears representing a total value of approximately \$800,000. This would make it appear that the electrolytic lead-refining capacity of the Consolidated Co's works at Trail is not as large as capacity of its lead blast furnaces for producing bullion.

The Lanark Mining Co., of Spokane, Washington, which for nearly two years has been working the old Lanark mine, near Illecillewaet, Revelstoke mining division, expects to commence in January operating its concentrating plant, now nearly completed. In 1915 nearly 100 tons of ore shipped to the smelting works at Trail, ran from 29 to 34 per cent. lead and from 26 to 33 oz. silver to the ton. During the first half of 1916, 415 tons averaging about 19 per cent. lead and 20 oz. silver to the ton, was shipped to Trail, and then production was suspended pending provision of a concentrator near the mine. The plant is designed to treat about 75 tons of ore a day. A Riblet aerial tramway, constructed in 1915 in two sections, is of a total length of 6,900 feet. Mr. W. B. Dornberg is in charge of the property.

Mr. L. R. Margetts, superintendent of the Anaconda Copper Mining Co's Washoe Sampling works, Montana, recently spent a week visiting lead-zinc mining properties in Ainsworth and Slocan divisions of West Kootenay district, British Columbia. He is reported to have said in Spokane, when on his homeward journey: "The field includes many valuable mining properties, some of which, though, are not being worked.

Production has been increased since the advance in the prices of metals. I heard of the transfer of various properties in different sections, and of improvements and new installations at several concentrating mills. At some of the mills the flotation concentration process is being used with success. We have begun negotiations for the shipment of zinc ore to the Anaconda Co's electrolytic reduction works at Great Falls, Montana."

### MINERS' CERTIFICATES.

The report has recently come to hand of the Board of Investigation appointed in British Columbia to inquire into the matter of alleged improper holding and using of certificates of competency by coal miners in the Comox Colliery, operated by the Canadian Colliery at Cumberland, B.C. The members of the Board were the Honorable Mr. Justice Macdonald, Robert R. Hindmarch and Robert Henderson. Counsel appointed by the Provincial Department of Mines brought to the Board's attention two cases where, apparently, certificates of competency had been improperly used. In one case a coal miner was convicted of an infraction of the Coal Mines' Regulation Act and his certificate was cancelled by the Department of Mines. Before the certificate was cancelled, however, a substituted certificate was issued to a person of the same name on the ground that his original certificate had been lost and this substituted certificate at the time of the cancellation referred to was still outstanding. A miner of the name in question was found in one of the mines, and when summoned, gave evidence that he had never been convicted of any offence under the Coal Mines' Regulation Act; it soon became apparent that for a time two persons had worked under the same certificate and that the genuine miner was entitled to hold the substituted certificate. The evidence indicated the ease with which a person could obtain the certificate of a miner, then change his name to suit the circumstances and obtain employment in a coal mine without being duly qualified. A special rule passed in December, 1914, requiring coal miners to deposit their certificates with the owner before obtaining employment in a mine greatly lessens the opportunity for accomplishing this fraudulent purpose. In the second case it appeared that after a miner had been killed while working in a mine, a substituted certificate was issued to a person of the same name on the ground that the original certificate had been lost. It was evident that fraud had been committed by a person familiar with the existence and contents of the original certificate and desirous of obtaining work in the colliery under false pretences.

### NEW JERSEY ZINC CO.

Boston.—The New Jersey Zinc Co. in 1916 paid dividends amounting to \$76 per share on its \$35,000,000 capital stock. Had the capital stock remained at \$10,000,000 dividends would have amounted to \$266 per share.

Not only was \$26,600,000 taken from the year's earnings for stockholders but large sums were spent on plant improvements and equipment while a material addition was made to surplus account.

The principal beneficiaries from the past year's dividends were the following: August Heckseher, \$2,448,264; Edgar Palmer, \$2,289,424; David B. Jones, \$1,366,176; T. D. Jones, \$1,431,724; J. L. Riker, \$831,516; J. P. Wetherell, \$1,339,000; S. P. Wetherell, \$956,536; J. E. Hayes, Jr., \$817,912; W. O. Morse, \$798,000.



## BOOK REVIEWS.

**Heaton's Annual, Heaton's Agency, Toronto, Price \$1.25.**

The thirteenth edition of Heaton's Annual has just come from the Press and again we have to note improvements which have marked its progress from year to year. The first part of the book contains complete official directories of the Dominion and Provincial Governments, to which is added this year a long list of titled and decorated Canadians that will be of interest to many families who have boys at the front; also postal information; a shipper's guide giving every banking town with banks and railway connections, population, etc; commercial regulations and complete customs tariff revised to date. In the last half of the book we find up to date complete descriptions of every commercial town in Canada with hotels in order of merit, industries, population and industrial opportunities and summary of the resources of the Dominion, covering agriculture, agricultural districts, finance, fisheries, forests, fur farming, mining, sport, water powers, etc. The information is up to date, clearly arranged and concisely stated. Cross references are given throughout the text to a most valuable bibliography of Government and Standard publications under the heading "Where to Find It" so that the reader has access to complete information upon any subject in which he is interested.

## THE CANADA YEAR BOOK, 1915.

This publication of the Census and Statistics Office, Ottawa, is now ready for distribution. It will be found to contain the following special articles: (1) Local Government of Canada by various writers; (2) Economic Geology in Canada 1915; (3) Flora of Canada; (4) Faunas of Canada. The following are the other principal new features of the work. In Section III (Area and Population), tables relating to the foreign-born population, the population of military age and the occupations of the people, as derived from the Census returns of 1911, replace other Census tables previously given. Statistics of the universities and of higher education generally have been added to the tables of elementary and secondary education in Section IV (Education). Amongst other new statistics in Section VI (Production), are tables of grain prices and of ocean freight rates over long series of years and of the numbers of farm live stock in the principal countries of the world. This Section includes also a description of the Dominion and Provincial Agricultural Experiment Stations. To Section VII (Trade and Commerce) have been added tables showing the increase or decrease due to variation in quantity and in price of the exports and imports of Canada, by principal classes of products, for the year 1915 as compared with 1914. In Section X (Finance), the results are given of further efforts to collect municipal statistics, the new tables presenting (a) statistics of a general character and (b) financial statistics. Section XI (Administration) includes an outline of the work of the Commission of Conservation and finally Section XII (Principal Events of the Year) summarises the Acts of Provincial Legislatures in addition to those of the Dominion Parliament as heretofore.

## MANDY MINING CO., MANITOBA.

The Pas, Man., Dec. 22.—H. C. Carlisle, superintendent of the Mandy Mining Co., a subsidiary company of the Tonopah Mining Co., returned to town from Philadelphia on Saturday last.

It is the intention of the Mandy Mining Co. to proceed at once with the active development of their property at Schist lake, and already a contract has been signed up with Charles Morgan for the hauling of 3,000 tons of ore from the mine to the head of navigation on Sturgeon lake, from where it will be brought to The Pas after the ice break-up in the spring by steamboat and barges, and shipped by rail to the smelter.

The operations of the Tonopah Mining Company in this district will henceforth be looked after by the Mandy Mining Co., which is under the control of the Tonopah people, and will have the same officials and staff.

The machinery and supplies necessary for active development work have been purchased, to the amount of several hundred tons, and will be taken to the mine by teams. The contractor expects to have about one hundred teams at work as soon as stables and road houses are completed.

The Mandy Mining Co., are making arrangements for the building of narrow-gauge railway over the portage, and, if found feasible, the shipment of ore will continue at the rate of 1,500 tons per week during the period of navigation each summer.

## QUINCY.

Quincy has run its daily tonnage up to between 4300 and 4400 tons daily, a wonderful production with only three shafts and with some of the rock coming from below the 70th level on the angle of the lode. Moreover, great care is taken to keep the reserves up to the proper figure all the time. This gain has come mostly from the increase in the force that it has been possible to make with those men who have been working outdoors in different parts of the country and who are now seeking cover.

## GRANBY.

Boston, Jan. 3.—For the first five months of its new fiscal year Granby Consolidated earned \$2,400,000, figuring its unsold copper at 25c a pound. Subsequent copper transactions at a higher price actually raised the earnings to about \$2,600,000 for the period to Dec. 1. This was at the rate of about \$6,000,000 for a full year.

Granby should have no difficulty in maintaining its new dividend rate of \$10 per annum even should copper metal take a severe slump. Granby has only 149,975 shares.

Development work at the Hidden Creek property is showing excellent results. Production all comes from above the tide water level, below which it is thought another large mine exists.

The Pas, Man., Dec. 22.—Frank Carrie, Jack Ham-mell's partner, departed for Toronto on Monday. Messrs. Dan and Jack Mosher, Dan Milligan and John Dion, who are also interested in the properties, went out on the same train. Dan Mosher stated that he thought diamond drills would be again working on the property in the near future.



**DOMINION ASSAY OFFICE, VANCOUVER, B.C.**

The Vancouver Daily Province said on December 30th: "That gold is commencing to flow in increasing quantity to the Dominion of Canada Assay Office, Vancouver, is shown not only by the returns for the calendar year ending to-day, but also by the returns for the month ending to-day. The new regulations inaugurated this year by which the Assay Office can issue cheques payable at par in New York have had their effect.

"The gold bullion deposited at the Dominion of Canada Assay Office for the calendar year ended December 31, 1915, represented in value \$2,736,302.31. For the calendar year ended to-day the total is \$2,828,239.65, showing an increase of \$91,937.34.

"For the month just closed the increase is more striking. For December, 1915, the total was \$189,304.47. For the month ending to-day it was \$262,663.43, showing the large increase of \$73,358.96.

"Mr. G. Middleton, manager of the Assay Office, said this morning that not only was gold coming to Vancouver that formerly went to Seattle, but that British Columbia mines are increasing their output. This is due partly to the fact that increased development naturally brings a larger output, but that returned soldiers are finding employment as mine-workers. Many of the mines would have shown larger returns during the earlier months of the year if men could have been found to work on them."

Note by Editor.—The British Columbia correspondent of The Journal states that he thinks either Mr. Middleton has misunderstood or is not yet fully informed as to the gold production of British Columbia in 1916, that is the total gold, including lode as well as placer gold. From figures the correspondent received late in December, he thinks it will be found that there has been less gold, both placer and lode, produced in the province in 1916 than in 1915. Rossland mines, which are the largest source of lode gold in British Columbia, made a much smaller production during the last two months of the year, owing to a shortage of coke at the smeltery for smelting gold-copper ores; the production from the Hedley Gold Mining Co's mine in Camp Hedley, was somewhat less than in 1915 and late advices from Cariboo state that the yield of placer-gold from that district shows a decrease this year owing to a short water supply for hydraulicking.

**U. S. IRON RECORDS SMASHED.**

The January first estimates of shipments of iron ore from United States mines during 1916 are 75,500,000 gross tons, compared to 55,493,100 tons for 1915, according to Ernest F. Burchard of the United States Geological Survey, Department of the Interior. Not only are these record-breaking figures, but the ore sold for \$178,935,000, an increase of over \$77,000,000 compared with 1915. Ore in stock at the mines approximates 10,486,000 gross tons, compared with 13,748,000 tons in 1915.

Production of pig iron in the United States also made a record in 1916 a total of over 39,000,000 gross tons, compared with 29,916,213 tons in 1915.

**DOMES.**

The official statement of production of Dome Mines for December shows gross output of \$183,300 from 39,000 tons of \$4.70 ore milled. This compares very favorably with the average for the year.

**DOMINION STEEL.**

Montreal, Que.—An official statement of the Dominion Steel Corporation's output for the calendar year 1916, issued to-day, showed a new record in tonnage of ingots, the figures being about 8 per cent higher than in 1915. Pig iron production was more than 12 per cent in excess of the previous year's showing. Coal output was lower at about 4,500,000 tons, against 5,000,000 in 1915, recruiting and the shortage of shipping facilities entering as adverse factors. The approximate output of the steel company is given as follows:

|                            | 1916    | 1915    | 1914    |
|----------------------------|---------|---------|---------|
| Pig iron .....             | 348,000 | 309,800 | 334,101 |
| Steel ingots .....         | 376,000 | 349,000 | 331,349 |
| Rails .....                | 17,495  | 57,500  | 176,505 |
| Wire rods .....            | 112,400 | 73,500  | 30,778  |
| Wire products .....        | 47,500  | 34,000  | 32,414  |
| Blooms, billets, etc. .... | 150,000 | .....   | .....   |
| Merchant bars .....        | 9,950   | .....   | .....   |

Large expenditures have been made during the year for improvements and extensions to plant, as well as for renewals.

The statement adds: "The tonnage of steel on order is sufficient to keep the works actively employed for several months, and so far there is no indication of any slackening in the demand for all the materials that the company can produce."

**CROWN RESERVE.**

The Crown Reserve mining company has taken an option on the O'Donnell claims adjacent to the property of Boston Creek Gold Mines and the R. A. P. Syndicate in the Boston Creek district.

**SILVER PRICES.**

|          |         | New York,<br>cents. | London,<br>pence. |
|----------|---------|---------------------|-------------------|
| December | 19..... | 76 $\frac{5}{8}$    | 36 $\frac{1}{2}$  |
| "        | 20..... | 76 $\frac{5}{8}$    | 36 $\frac{1}{2}$  |
| "        | 21..... | 76 $\frac{1}{2}$    | 36 $\frac{1}{2}$  |
| "        | 22..... | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |
| "        | 26..... | 75 $\frac{3}{4}$    | ....              |
| "        | 27..... | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |
| "        | 28..... | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |
| "        | 29..... | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |
| "        | 30..... | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |
| January  | 2.....  | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |
| "        | 3.....  | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |
| "        | 4.....  | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |
| "        | 5.....  | 75 $\frac{3}{4}$    | 36 $\frac{1}{2}$  |

**MOLYBDENITE PRICES.**

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% MoS<sub>2</sub>, \$14.00 per unit.  
Ores carrying between 3% and 5% MoS<sub>2</sub>, \$16.00 per unit.  
Ores carrying between 5% and 10% MoS<sub>2</sub>, \$17.50 per unit.  
Ores carrying between 10% and 15% MoS<sub>2</sub>, \$18.50 per unit.  
Ores carrying between 15% and 20% MoS<sub>2</sub>, \$19.50 per unit.

80% concentrates, \$1.09 per lb. of MoS<sub>2</sub>.

Penalties imposed for copper and bismuth.

No settlement made for any molybdenic oxide in ores.

Settlement ten days after sampling.

Samples of ores to be submitted before any shipment made.

## MARKETS

## TORONTO MARKETS.

Cobalt oxide, black, \$1.05 per lb.  
 Cobalt oxide, grey, \$1.15 per lb.  
 Cobalt metal, \$1.25 to \$1.50 per lb.  
 Cobalt anodes, \$1.50 to \$1.75 per lb.  
 Nickel metal, 45 to 50 cents per lb.  
 White arsenic, 5½ to 6 cents per lb.

Jan. 8, 1917—(Quotations from Canada Metal Co., Toronto)—

Spelter, 13½ cents per lb.  
 Lead, 9½ cents per lb.  
 Tin, 46 cents per lb.  
 Antimony, 18 cents per lb.  
 Copper, casting, 35½ cents per lb.  
 Electrolytic, 36 cents per lb.  
 Ingot brass, yellow, 22 cents; red, 24 cents per lb.

Jan. 8.—(Quotations from Elias Rogers Co., Toronto)—

Coal, anthracite, \$9.00 per ton.  
 Coal, bituminous, \$10.00 per ton.

## NEW YORK MARKETS.

Connellsville Coke—

Furnace, spot, \$11.00 to \$12.00.

Furnace, contract, \$6.00 to \$8.00.

Foundry, prompt, \$11.00 to \$12.00.

Foundry, contract, \$5.50 to \$7.50.

Straits Tin, f.o.b., nominal, 42.50 cents.

Copper—

Prime Lake, nominal, 28.50 to 29.00 cents.

Electrolytic, nominal, 27.75 to 28.25 cents.

Casting, nominal, 27.00 to 27.50 cents.

Lead, Trust price, 7.50 cents.

Lead, outside, 7.50 to 7.62½ cents.

Spelter, prompt western shipment, 9.67½ to 9.92½ cents.

Antimony—Chinese and Japanese, 14.25 to 14.50 cents.

Aluminum—nominal—

No. 1 Virgin, 98-99 per cent., 60.00 to 64.00 cents.

Pure, 98-99 per cent. remelt, 55.00 to 58.00 cents.

No. 12 alloy remelt, 40.00 to 45.00 cents.

Powdered aluminum, 90.00 to 93.00 cents.

Metallic magnesium—99 per cent. plus, \$3.50.

Nickel—shot and ingot, 45.00 cents.

Electrolytic, 50.00 cents.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$80.00.

Cobalt (metallic), \$1.50.

Tungsten ore per unit, \$17.50 to \$20.00.

Silver (official), 75¾ cents.

Metal Products—Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

Sheet Copper—

Hot rolled, 42.00 cents.

Cold rolled, 43.00 cents.

Copper bottoms, 50.00 cents.

Copper in rods (round), 41.00 cents.

Square and rectangular, 42.00 cents.

Copper wire, nominal, 34.75 cents.

Copper wire, February, nominal, 34.50 cents.

High brass—

Sheets, 39.00 to 40.00 cents.

Wire and light rods, 40.00 cents.

Heavy rods, 38.00 to 39.00 cents.

Low Brass—sheet wire and rods, 42.00 cents.

Tubing—

Brazed bronze, 51.00 to 52.00 cents.

Brazed brass, 48.00 to 49.00 cents.

Seamless copper, 45.00 to 46.00 cents.

Seamless brass, 43.00 to 45.00 cents.

Seamless bronze, 52.00 cents.

Full lead sheets, 9.25 cents.

Cut lead sheets, 9.50 cents.

Sheet zinc, f.o.b. smelter, 21.00 cents.

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell & Co., Toronto.)

As of close January 8th, 1917.

## Porcupine Stocks.

|                         | Bid.  | Asked. |
|-------------------------|-------|--------|
| Apex .....              | .12½  | .13    |
| Dome Extension .....    | .30¾  | .31    |
| Dome Lake .....         | .64   | .69    |
| Dome Mines .....        | 23.50 | 24.50  |
| Foley O'Brien .....     | .70   | ...    |
| Gold Reef .....         | .05¼  | .05½   |
| Homestake .....         | .58   | .60    |
| Hollinger Cons. ....    | 6.85  | 6.90   |
| Inspiration .....       | .23   | .25    |
| Jupiter .....           | .32½  | .33    |
| McIntyre .....          | 1.99  | 2.00   |
| McIntyre Extension ..   | .60   | .62    |
| Moneta .....            | .15¼  | .16    |
| Newray .....            | 1.40  | 1.41   |
| Porcupine Crown .....   | .75   | .78    |
| Porcupine Gold .....    | .01   | .02    |
| Porcupine Imperial ..   | .04¼  | .04¾   |
| Porcupine Tisdale ..... | .05⅞  | .05¼   |
| Vipond .....            | .50   | .52    |
| Preston East Dome ..... | .04½  | .05⅞   |
| Schumacher .....        | ...   | .72    |
| Teck Hughes .....       | ...   | .74    |
| West Dome .....         | .31   | .32    |
| Boston Creek .....      | 1.14  | 1.16   |
| Ken, Silver .....       | .30   | .30½   |

## Cobalt Stocks.

|                         | Bid. | Asked. |
|-------------------------|------|--------|
| Adanac .....            | ...  | .25    |
| Bailey .....            | .06½ | .07½   |
| Beaver Con. ....        | .40  | ...    |
| Buffalo. . . . .        | 1.00 | 1.25   |
| Chambers Ferland .....  | .16  | .17    |
| Coniagas .....          | 4.40 | 4.50   |
| Foster .....            | .04  | .05    |
| Gifford .....           | .04  | .04¾   |
| Gould .....             | .00¼ | .00¾   |
| Great Northern .....    | .11  | .12    |
| Hargraves .....         | .19½ | .20    |
| Hudson Bay .....        | ...  | 74.00  |
| Kerr Lake .....         | 4.70 | 4.90   |
| La Rose .....           | .53  | .56    |
| Lorrain Con. ....       | .50  | .51    |
| McKinley Dar. Sav. .... | .49½ | .51½   |
| Nipissing .....         | 8.30 | 8.60   |
| Ophir. . . . .          | .11¼ | .11½   |
| Peterson Lake .....     | .10½ | .11½   |
| Right of Way .....      | .05½ | .06    |
| Seneca Superior .....   | .02  | .03    |
| Silver Leaf .....       | .02¼ | .02½   |
| Shamrock Cons. ....     | .20½ | .21    |
| Temiskaming .....       | .60  | .63    |
| Trethewey .....         | .16  | .18    |
| Wettlaufer .....        | .09  | ...    |
| York, Ont. ....         | .02  | .02¼   |



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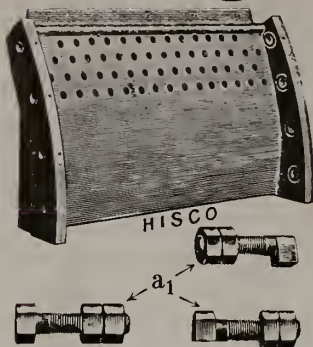
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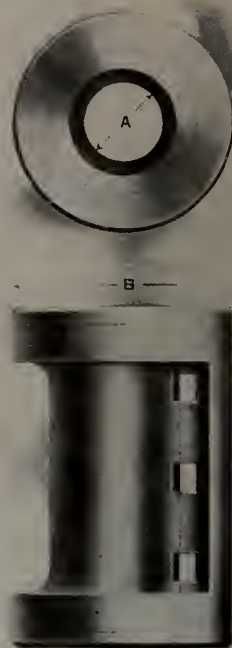
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The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

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Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

### GEOLOGICAL SURVEY

#### Recent Publications

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

Memoir 81. The Oil and Gas Fields of Ontario and Quebec, by W. Malcolm.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camell.

Memoir 85. Road Material Surveys in 1914, by L. Reinecke.

Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.

Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.

Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.

Ontario. Topography.

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Map 66A. Brechin Sheet, Ontario and Victoria Counties,

Map 150A. Ponthook Lake Sheet, Nova Scotia.

Map 153A. Asquith and Churchill Townships, Sudbury District, Ontario.

Map 158A. Nanaimo Sheet, Vancouver Island, British Columbia.

Map 175A. Ymir, Kootenay, British Columbia.

Map 181A. Wood Mountain-Willowbunch Coal Areas, Saskatchewan.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

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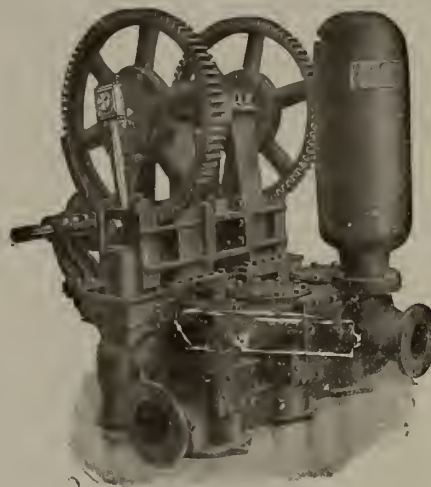
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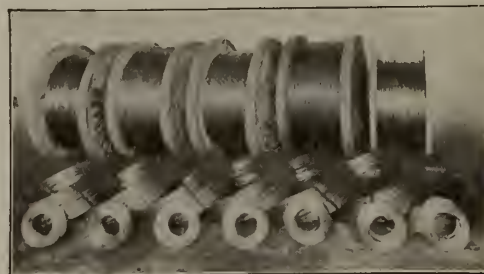
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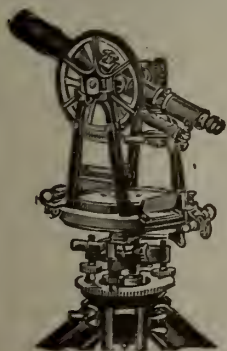
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, February 1st 1917.

No. 3

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

Head Office . . . . . 263-5 Adelaide Street, West, Toronto  
Branch Office . . . . . 600 Read Bldg., Montreal

Editor

**REGINALD E. HORE**

**SUBSCRIPTIONS** — Payable in advance, \$2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, \$3.00 a year.

Advertising copy should reach the Toronto Office by the 8th, for issues of the 15th of each month, and by the 23rd for the issues of the first of the following month. If proof is required, the copy should be sent so that the accepted proof will reach the Toronto Office by the above dates.

### CIRCULATION

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

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### WASTE THROUGH DUPLICATION

It is strange that at this time when there is such serious need of economy and more intelligent development of our resources that more attention is not given to the reorganizing of the Departments at Ottawa. Instead we have the spectacle of increase in organizations for duplicating work.

It has been recognized clearly that we are suffering from lack of knowledge of our resources and methods of utilizing them. There is a demand for a more systematic inventory of our men and our industries. These things the Government seems to appreciate.

There seems as yet however to be lack of appreciation of the fact that existing departments are qualified to do the necessary work if given capable direction. The various departments are being allowed to go along in the old ruts accumulating facts without assimilating them. Worse still, several departments are collecting the same data. The amount of overlapping in government departments is bad enough at any time. With the demands now being made upon the country it is criminal to allow it to continue.

Unfortunately conditions seem to be growing worse instead of better. Instead of developing the departments which could do the necessary work systematically and economically, our Ministers seem to think the proper thing to do is to follow popular fancies in fashion in various countries and organize new departments to conduct special work. Thus following President Roosevelt we had established in Canada a Commission of Conservation which spends much of its efforts in duplicating work done in other departments and publishing such ridiculous accounts as that claiming the discovery of phosphate deposits in the Rockies, when as a matter of fact what had been done was the re-discovery of deposits known to be of no economic value.

More recently we have had thrust upon us an advisory council on Industrial and Scientific Research headed by a professor of Physiology who is an eminent authority on the composition of cellular and tissue fluids in the animal body; the inorganic composition of secretions and excretions; and the physical and chemical factors in heredity. This advisory council is starting its work by sending out a sheaf of enquiries which indicate that it does not know or care what the existing government departments are doing or have done.

It is not only these special commissions that duplicate the work. The several departments of government are regularly doing work which they have no business to be doing. Some not content with their own collections of data, copy and republish data collected and published by other departments. A glaring ex-

ample of this is the rehash of the reports of the Customs Branch published by the Department of Trade and Commerce, so that, for instance, the absurd valuation of nickel matte in the Customs reports is repeated in the reports issued on the value of our exports. The data are apparently not understood by those responsible for their republication and consequently are not put in such form as to be of much use to the reader.

No one political party can be blamed for the present condition of affairs. The public appoints as its representatives many men who are unfit for the job, and Ministers are chosen as heads of Departments without regard to their abilities. Thus we have the direction of important departments placed in the hands of men who have shown no ability in the organizing and direction of their staffs. Many Ministers seem to think their chief work is the adjustment of patronage matters in their respective constituencies.

Compared with other industries mining has at its service at Ottawa an unusually efficient staff of technical men. The organization of the Mines Branch at Ottawa is such that real assistance is given to the industry in spite of weakness at the top. The nucleus of a strong department exists and it is a pity that the work of the Branch is held back by lack of a leader. Why cannot we have as Minister of Mines a man who knows something about mining? Why are other departments of the government permitted to attempt to duplicate the work of the Mines Branch and to detract from the efficiency of both? Why do we have an Advisory Council composed of men unqualified to give advice on the application of science to industry, and unfamiliar with the work of the various departments?

### A MISLEADING PROSPECTUS.

The mails are being loaded these days with the literature of brokers offering for sale stock in new mining companies. Mining engineers would do well to acquaint themselves with what is going on. They should do what they can to prevent the misrepresentation which is becoming more and more common.

There has recently come to our attention the case of a company organized to develop a copper property in Ontario. The New York broker who offers the stock for sale makes statements regarding the property which are quite unwarranted by the facts and links with the enterprise the name of a Toronto mining engineer, Mr. Robert Bryce.

The prospect is described as sufficiently developed to mine and ship ore which will produce immediate profits to the company, and it is stated that in a few months the company should be earning at the rate of \$1,000,000 per year. Mr. Bryce's report does not contain any such information.

We are pleased to learn that Mr. Bryce as soon as he saw what the brokers were doing, resigned as consulting engineer of the company and endeavored to prevent the further dissemination of the misleading literature.

## SILVER AT 1600 FEET

One of the most important discoveries yet made at Cobalt is reported from the Beaver mine. A vein 4 in. to 6 in. wide, rich in silver, has been encountered at the 1,600-ft. level. The vein has been found by sinking through a thick diabase sill and then exploring the underlying Keewatin rocks. The find is confirmed just as we go to press. Further particulars will be given in our next issue.

It is with great regret that the mining men of Canada learned of the death on Saturday, January 20th, of Col. A. M. Hay. The Colonel was universally well liked and will be greatly missed by those who had the pleasure of knowing him. He was the life of many a gathering and will always be remembered with kind thoughts. Members of the Canadian Mining Institute had come to regard the Colonel as one of their most valuable possessions, for he helped to make enjoyable all our meetings. No one held the welfare of the Institute more closely to his heart.

Mr. Wilson says he is longing for world peace. The Allies are fighting for it.

### THE BALLOT FOR SIMPLER SPELLING.

(In the writer's Amended Spelling.)

Editor Canadian Mining Journal,—

Sir, About twelve years ago the elder Stead put out an article after an article in his "Review" with the heading: Wake up, John Bull! urging that Britishers were slipping behind in their competitive race with other nations. The War's course has now burned this into our souls. Need of increased efficiency is manifest in a thousand and one ways.

This leads me to express a hope that at the pending Annual Election among American mining engineers the ballot for Simpler Spelling should be not overlooked, but met overwhelmingly in its favor. A people that wastes its efforts and energy on silent and useless letters; but contributes to their own defeat by such waste that employed to effect, would turn many a scale in their favor, spells Sieve with five letters, when three are enough, and has the ever-puzzling i.e. (or is it e.i.?). to say nothing of its analogy to sift. This example could be multiplied a thousand fold. We should get at the core of this by the most direct route.

The list proposed (about thirty short end forms, half of them in frequent use already) makes a good beginning,—often half the battle.

Respectfully,

Toronto, 22nd Jan.

A. HAMILTON.



## MINING IN THE PROVINCE OF QUEBEC IN 1916

By T. C. Denis, Superintendent of Mines.

The first effect of the war on the mining industry of the Province of Quebec, was a marked depression. The production of asbestos figures for a large proportion in the table of the products of the mines of this province, and during the first year of the war the market for asbestos was demoralized. But after the all-absorbing necessities of the moment had been met, came a wave of intense organization and production, in view of the future needs of the war. Then the mining industry came into its own, and since the autumn of 1915 the demand for asbestos has been very keen, the prices have been higher than they ever were before, and the output has only been limited by the great shortage of labor which has prevailed during practically the whole of 1916. The asbestos mines of Thetford, Black Lake and Danville under the present conditions, could give steady employment to six hundred more men than they have now. As to prices, more especially for better qualities, they are very satisfactory. Crude No. 1 and No. 2 have more than doubled in price, and for some special grades of No. 1, which two years ago might have brought \$400 a ton, as much as \$1,200, and even more has been quoted. A very important use of the substance, which has developed during the last eighteen months, is the introduction of the asbestos fabrics in the manufacture of automobile tire covers, to replace the heavy duck used heretofore. It is said that the vegetable fibre of the duck is somewhat affected by contact with the hot liquid rubber in the process of manufacturing these tires, and that the fabric deteriorates easily, whereas the mineral fibre of asbestos remains quite unaffected, and the life of the tires is thereby doubled.

Similar remarks as to the cause of renewal of activity in mining apply to chromite and magnesite, two products for the supply of which the United States relied greatly on foreign sources. The chromite production of the Coleraine—Black Lake district—will be, by far, the highest on record during the year 1916, and as to magnesite from the Argenteuil fields, it is sufficient to mention that in 1915 the production totaled 16,000 tons, while in 1916 shipments at the rate of 150 tons and more a day were made during the greater part of the year. The shipping of magnesite has been greatly hampered by the bad state of the roads. The magnesite mines, or quarries, in Argenteuil county, are from 8 to 12 miles distant from the railway and haulage is very expensive. The Scottish-Canadian Magnesite Co., one of the important producers, has just completed a railway spur, twelve miles long, connecting the mine with the station of Grenville on the C. P. R., and this company will, in the future, be independent of the state of the roads for shipping their product.

Great activity has prevailed in the mining of chromite. The prices offered are from three to four times those prevailing before the war, and this has led to a feverish reopening of the chromite mines and occurrence of the Coleraine region. Whereas in 1914, chromite was quoted in New York at \$14 a ton for 50 per cent. ore, this is now \$45. The Mutual Chemical Co. has two mills running on the concentration of chromite, one of which is a custom mill at Black Lake and the other at Little Lake St. Francis. From all appearances the production of euphriferous pyrite of the Eastern Townships will be from one-quarter to one-third

higher in tonnage than in 1915. Both the Eustis Mining Co. and the Weedon Mining Co. have been very active throughout the year.

The largest producing molybdenite mine in Canada, and probably in North America, is being earnestly worked in Onslow township, about 30 miles from Ottawa. In this occurrence molybdenite is associated with a very coarse-grained rock, containing hornblende, pyroxene, plagioclase and quartz, with pyrrhotite and pyrite. This rock appears to penetrate a flesh-red fine-grained granite. The mine is being worked by the Canadian-Woods Molybdenite Co., and the ore is being shipped at the rate of 200 to 300 tons a week, with a molybdenite content of 2 to 5 per cent. Some specially selected carloads have gone even higher. The ore is sent from the mine to concentrating mills in Ottawa, in Renfrew and in Denver, Colorado. A large mill, to handle 120 tons of rock a day, is under construction at the mine, and is expected to be running very shortly. The process installed in this mill is the Woodwater flotation process, which, the operators state, is the one which has given the most satisfactory results in the concentration of molybdenite. The price of Canadian molybdenite has been set by the British Government at 105 shillings a unit delivered in England; this is equivalent to about \$1.10 a pound of pure molybdenite. In the United States, molybdenite is also much in demand, and at higher prices, as much as \$1.75 a lb. being quoted in the metal trade papers.

Among other mineral products of the Province of Quebec, which were much stimulated by the war, may be mentioned zinc, lead and china clay.

On the whole, the war has proved a stimulant to the mining industry of the Province of Quebec, and it is expected that the quantities and the values of the products of the mines, exclusive of the building materials, will show a marked increase in 1916 as compared with 1915. This increase, however, will somewhat be counterbalanced by a probable decrease in structural materials, such as building stone, brick and other clay products, on the production of which the economic conditions now prevailing throughout the world have had a depressing effect.

### A WONDERFUL NICKEL DEPOSIT.

One of our readers sends us the following letter which he received recently from a correspondent in Sudbury:

Dear Sir,—

Regarding our conversation in the Balmoral Hotel about my Nickel claim I hereby enclose you a Report by one of the most Reliable mining men in this North Country. And who discovered the first nickel in this Country. I would to hear from you as I am anxious to have a sale made as soon as Possible as the goods are their sure. Hoping to hear from you soon.

Yours truly,

P. S.—I was trying to get a map to send you But could not get one.

The report accompanying the correspondent's letter follows:

Sir,—I have examined your mining claim with found a very good stain cross the lot and two little pits to the Dept of about four feet with showed perrited and gossen in different places which the property looks very good to me and promising of a good Body of Nickel ore.



### NATIONAL RESOURCES SURVEY.

Arthur D. Little, Ltd., Chemists, Boston, Mass., now doing some work in Canada for the Canadian Pacific Railway, have issued the following statement concerning their plans.

The first step in any plan for the broad development of the Natural Resources of the Dominion necessarily involves the collection of definite and accurate information regarding the resources themselves and the systematic classification of this information in such form that it shall be readily available to those who may be expected to utilize it to advantage.

With full appreciation of the splendid work of many governmental, corporate and private agencies it may fairly be said that the resources of Canada have as yet scarcely been touched. Many recognized sources of national wealth and individual prosperity are still practically ignored. Undoubtedly many others, now wholly unknown, await discovery and exploration.

It is nevertheless true that a vast amount of information of the highest practical value has been accumulated by the Government Departments, notably, for example, by the Department of Mines and the Water Powers Branch; Department of the Interior, the Railways, the Canadian Mining Institute, Society of Chemical Industry, and other scientific bodies, trade organizations, industrial corporations and other individual explorers, engineers and prospectors. A continuous and increasing stream of data may confidently be expected to flow from these sources. The immediate need is, therefore, not for new agencies for obtaining new facts, but for an effective organization which shall collate and classify the data already in hand or directly forthcoming. It is the hope and purpose of its sponsors to supply such an organization in the Natural Resources Survey.

It is the initial object of the Survey to recast into quickly available form the immense mass of valuable information regarding Canadian resources now stagnant in Government publications, scientific and technical journals, corporation records and the special reports of individuals. It is therefore proposed to abstract this data and transfer the salient and important facts regarding agriculture, mines, minerals, water-powers, forests, fisheries and furs to standardized forms capable of close classification and to so control and key the information that related groups of facts may be promptly furnished as required. Concurrently therewith and supplementary thereto a census will be made of Canadian scientific and technical men with particular reference to their specialized lines of study and performance; the special libraries and research facilities of the country will be catalogued and classified lists made of the corporations and individuals most directly interested in specific natural resources, and presumably able to utilize them to advantage.

This plan, so comprehensive in scope and involving such widespread benefits to the Dominion, was originated by Lord Shaughnessy. Its development was in May, 1916, entrusted by His Lordship to Arthur D. Little, Limited, a Canadian Corporation operating under Dominion charter, and including in its organization chemists and engineers of many years experience in the industrial applications of science in many parts of the world. In their consideration of the broader questions of policy and development the Directors will be guided by the Survey Advisory Board composed of eminent specialists and organizers.

Although initiated by the Executive of the Canadian Pacific Railway and supported by that Company the work of the Survey will be conducted in the interest of no individual or corporation, but impartially for the benefit of all and with the sole purpose of advancing the industrial development and prosperity of the Dominion.

Obviously a work of this magnitude cannot attain its full measure of usefulness without the cordial support and concurrent effort of all the agencies, organizations and individuals having at heart the welfare of the nation and in position to cooperate with the Survey. The Directors have already been assured of the support of scientific organizations and business associations and they confidently appeal to corporations and individuals throughout the Dominion for co-operation. The mass of detail to be considered is so great that the Survey must in large part rely upon the voluntary assistance of occasional and part time collaborators and the Directors therefore particularly desire to be brought into touch with scientific and technical specialists who are prepared to furnish information regarding specific resources or willing to abstract reports and publications dealing with such resources.

The Survey intends to issue from time to time Bulletins devoted to particular resources or immediate industrial opportunities and to place as occasion arises special reports before corporations and individuals in Canada, Great Britain and the United States, who may be expected to base industrial development thereon.

The plan of the Survey further provides for the prosecution of industrial research on lines selected for their promise of yielding results of broad general benefit or of immediate advantage to individual communities or industries.

The Survey is, obviously, a natural complement and correlative of the larger plans, to which the Federal and Imperial Governments are committed, for mobilizing the resources of the Dominion and the Empire.

Correspondence regarding the work of the Natural Resources Survey and tenders of cooperation should be addressed to the Directors, Arthur D. Little, Limited, 137 McGill Street, Montreal.

### THE PENSION BOARD.

The Dominion Government have appointed a Board of Pension Commissioners for Canada with offices in Ottawa. As this Board wish to cause as little delay as possible in dealing with communications with regard to pensions, they wish the public to correspond directly with the Board of Pension Commissioners, Ottawa.

A great deal of delay may be caused by communications being sent through other Departments of the Government.

The Patriotic Fund Association and the Military Hospitals Commission have kindly consented to give information and assistance to those wishing to write direct to the Board of Pension Commissioners. These societies have offices in certain localities throughout Canada.

In addition, in order to facilitate the granting of pensions, the Board is opening Branch pension offices in Vancouver, Calgary, Edmonton, Regina, Winnipeg, London, Hamilton, Toronto, Barrie, Kingston, Ottawa, Montreal, Quebec, St. John and Halifax. All information with regard to pensions may be obtained from these offices.



## NITRATES FROM THE AIR

By W. L. Goodwin.

It was in Norway, with its fine waterpowers for generating cheap electricity, that (in 1905) nitric acid was first profitably made from air. This result was due to Birkeland and Eyde, whose process was soon adopted extensively in other countries. The success of the process depends on heating the air to the high temperature of the electric arc, about 3,000 degrees C., and then cooling it as quickly as possible. It is interesting to note that a Queen's graduate, G. W. Morden, made an important improvement in the apparatus, using short electric arcs with water-cooled anodes. Birkeland and Eyde's improvement was to generate the electric arc in a strong magnetic field. This caused it to spread out as a large disc, which increased the active area very much. In 1912 the factory at Notodden, Norway, was treating about 700,000 litres of air a minute, giving about 45 lbs. of nitric acid, which, converted into nitrate of lime, amounts to about 20,000 tons of that substance per annum. In 1905, the first apparatus was installed to use 160 H.P. In 1915 the business had expanded to the extent of using 250,000 H.P. in Norway alone. The acid is converted into nitrate of lime for fertilizer, into ammonium nitrate for the manufacture of explosives, and into several other compounds for the chemical industries. For several years English manufacturers of explosives sent ammonia solution to Norway to be returned as ammonium nitrate. But this situation has been apparently redeemed by E. K. Scott, whose improvements if proved successful may bring much of this important chemical waste to England. He uses the waste heat of the arc to generate steam, which thus provides part of the power for producing the arc. Another gain is in using instead of air a mixture of oxygen and nitrogen in equal parts by volume, easily made by a liquid air machine. Scott's third improvement is in using an arc at 4,200 degrees instead of the usual practice of 3,200 degrees.

By this process the first product, formed in the electric arc, is an oxide of nitrogen which on mixing with more oxygen and water combines with them to form nitric acid. Thus the only raw materials required are air and water, practically inexhaustible.

But we are not dependent on the direct oxidation of atmospheric nitrogen. In 1892 a Canadian, T. L. Willson, made possible the commercial manufacture of calcium carbide, which up to that time had been a rather expensive chemical curiosity. In 1895-97 Frank and Caro elaborated a process for combining this with nitrogen to form a substance, calcium cyanamide, which yields ammonia when acted on by water. Now ammonia is almost as good as nitrate for fertilizing purposes, and when nitrate is required it can be made by the oxidation of ammonia. In 1912 the manufacture of this new fertilizer, called commercially nitrolime, had increased to 165,000 tons a year, in Norway, Germany, Austria, Italy, France, Switzerland, the United States, Central Provinces of India, and Japan, but none in Great Britain. But the largest factory has been built by British capital in Norway at Odda near the beautiful Hardanger Fjord, where a very large waterpower is available. At that time 20,000 H.P. was in use and 80,000 H.P. ready. The nitrogen is extracted from the air by liquefying the air with a Linde machine, from which the nitrogen, boiling at a lower temperature

than oxygen, can be delivered fairly pure. If nitrolime is used to make ammonia to be oxidized to nitric acid, an analysis of the whole process shows that the elements of this nitric acid come from air and water, just as in the case of the first process described. The Linde machine can be so designed as to deliver nitrogen and oxygen separately, both fairly pure, and it is thus possible to provide at one operation the nitrogen for the manufacture of nitrolime, and the oxygen to convert the ammonia into nitric acid. However, the nitrolime is usually applied directly to the soil, where it is slowly acted on by the water and thus supplies ammonia to the plants. It is believed that it is in part directly assimilated. The physiologist will be interested in noting that when nitrolime slowly decomposes in the soil it forms urea and later ammonium carbonate. In 1914, in a review of the state of the cyanamid (nitrolime) industry in the United States, the statement is made that the cost of food products has increased twice as fast as the general cost of living, and it was pointed out that in that country cyanamide is the cheapest form of nitrogen fertilizer. The electric arc process for nitric acid and nitrate can not, it is contended, compete with it, owing to the high cost of electricity.

But chemists have found a third way of "fixing" the nitrogen of the atmosphere so as to make it ready for plant food. In 1881 an English chemist named Johnson stated that nitrogen and hydrogen combined slightly when in the presence of hot spongy platinum, a small proportion of ammonia being formed. This was disputed at the time by two other English chemists, who promptly proved Johnson to have made a mistake. But time has shown that he had made no mistake, and the elaboration of a commercial process for making ammonia by the direct combination of hydrogen and nitrogen is a brilliant triumph, due to the German chemist Haber. The thing looked hopeless at first sight. The combination ceased as soon as about one-tenth of one per cent. of the gases had combined. But Haber, working at very high pressure and using crude uranium instead of platinum to assist combination, succeeded in bringing the yield up to over 10 per cent., which made the process a practicable one. The hydrogen is made by the decomposition of water, so that the sources of the raw materials are as before, water and air. The economical oxidation of ammonia to nitric acid seems to have been lately worked out by Ostwald in Germany, and it is claimed that in that country the three processes for making nitrogen compounds out of atmospheric nitrogen are all at work, making Germany independent of the South American nitrate beds.

So far, the subject has been discussed from the point of view of nitrogen fertilizers; but this by no means covers the ground. Large quantities of nitric acid, nitrates, and ammonia are used in the manufacture of explosives, for use in war and the peaceful occupations of mining, railway building, etc. Another class of nitrogen compounds, the cyanides, are required for the extraction of gold and silver from their ores. Large quantities of ammonia are used in refrigerating plants, the use of which is extending very fast. Outside of these larger requirements the chemical industries absorb very considerable quantities of nitrogen compounds.

\* Extracts from an Article Published in "Queen's Quarterly."



The whole subject is just now under review in the United States. The editor of The Journal of Industrial and Engineering Chemistry estimates the U.S. supply of nitrogen compounds for 1916 as follows:

| Tons of N.                                  |         |
|---------------------------------------------|---------|
| Sulphate of ammonia (produced from coal) .. | 53,600  |
| Sulphate of ammonia, imported .....         | 4,500   |
| Nitrate of soda, imported .....             | 187,200 |
| Cyanamid, imported .....                    | 11,500  |

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256,800

These materials are for the following purposes:

| Tons of N.                                     |         |
|------------------------------------------------|---------|
| Sulphate of ammonia, for chemical industries.  | 21,700  |
| Sulphate of ammonia, for refrigerating ..      | 12,600  |
| Sulphate of ammonia, for agriculture .....     | 23,800  |
| Nitrate of soda, for chemical industries ..... | 155,600 |
| Nitrate of soda, for agriculture .....         | 31,600  |
| Cyanamid for agriculture, etc.....             | 11,500  |

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256,800

It is to be noted that the industries other than agricultural absorb about three-quarters of the total, and that only about one-fifth of the whole of this combined nitrogen is home production. Lawrence Addicks, commenting on this state of affairs, writes in the November number of the same journal: "It has been long evident, and for a little while generally appreciated, that were we to have a war with a first class power about half of our navy would be engaged in protecting our line of communication with Chile, instead of protecting our coast; and, as nitric acid is indispensable in the manufacture of explosives this has given the government a special interest in the development of a process requiring no imported supplies." This statement would apply to any country with a large seaboard, and no factories for the production of nitrogen compounds from air. The U. S. Government has lately voted \$10,000,000 to establish a national nitric acid works. The chairman of the committee appointed to carry out the project has written to a member of our Chemistry staff (Major L. F. Goodwin) asking his advice.

The success of the artificial nitrate and the cyanamid industries depends on cheap waterpower to generate the electric current required. Haber's ammonia process is independent of this, but for the manufacture of nitric acid at least it could hardly compete with the other two under normal commercial conditions. I suppose that there are few countries in the world where waterpower is available in such large quantities as in Canada. And as the atmosphere is common property, there is no reason why Canada should not become one of the largest, if not the largest, producer of these important substances. She has already taken the lead in the manufacture of carbide, the starting point for the manufacture of cyanamid. Considering the vast national importance of these nitrogen compounds in peace and war, it would seem as if they should be the first to engage the attention of the lately appointed committee on Industrial Research.

At present the demand for nitric acid for the manufacture of explosives is enormous, and it is a difficult economic problem to provide for war conditions. If private capital is invested in the necessary plant it will be idle in times of peace, as the war requirements are far in excess of any probable demand in times of peace. It is this consideration which has prompted the U. S. government to make the manufacture of nitric acid from air a government enterprise. It may be that this

will lead to a more general use of such materials in intensive farming. A government works could continue to manufacture in peace times and so keep the price of nitrate down. This would encourage farmers to use it. But, of course, such a condition could not be permanent. Ultimately the government works would have to be in the same position as any other preparation for war. It would have to remain idle in times of peace.

A writer in a recent number of The Journal of the Society of Chemical Industry states that it is feared in Germany that at the end of the war foreign competition in all those industries which depend on these substances will be overpowering. The Chilean nitrate deposits are in the hands of an English-French syndicate. The Northwestern Cyanamid Co. controls 1,000,000 H.P. of waterpower in Scandinavia. English interests have secured control of great waterpowers in the United States and Canada. All this at least emphasizes the importance of taking such measures in this country as shall secure for Canada the control of this very important industry. In too many cases we have allowed vast Canadian resources such as our nickel deposits and our pulpwood forests to pass largely into foreign hands. This should be prevented by a combination of wise legislation, public spirit, and scientific enterprise.

#### PIG IRON AND STEEL IN 1916.

The Dominion Department of Mines has received from the producers a record of the production of pig iron and of steel ingots and castings during the first eleven months of the year which together with the estimates for December show a probable production of pig iron in Canada during the twelve months ending December 31, 1916, of 1,171,727 short tons (1,046,185 gross tons), and a probable production of steel ingots and direct steel castings of 1,454,124 short tons (1,298,325 gross tons), of which 1,423,485 short tons were steel ingots and 30,639 short tons were direct castings.

The production of pig iron in 1915 was 913,775 short tons and of steel ingots and castings 1,020,896 short tons, showing an increase in the production of pig iron in 1916 of about 28 per cent. and an increase in production of steel ingots and castings of over 42 per cent.

The 1916 production was greater than that of any previous year, the second largest production of pig iron having been 1,128,967 short tons in 1913 and of steel ingots and castings 1,168,993 short tons also in 1913.

The production in 1916 during the first six months and monthly during the last six months was as follows in gross tons:

|                                  | Pig Iron<br>Gr. tons. | Steel<br>Ingots<br>Gr. tons. | Direct<br>Castings<br>Gr. tons. | Total<br>Gr. tons. |
|----------------------------------|-----------------------|------------------------------|---------------------------------|--------------------|
| 6 months ending—                 |                       |                              |                                 |                    |
| June. ....                       | 501,872               | 577,999                      | 11,715                          | 589,714            |
| July. ....                       | 82,154                | 101,178                      | 2,284                           | 103,462            |
| August. ....                     | 78,450                | 108,889                      | 2,299                           | 111,188            |
| September. . .                   | 91,736                | 116,828                      | 2,524                           | 119,352            |
| October. ....                    | 101,436               | 126,577                      | 2,924                           | 129,601            |
| Nov. (partly<br>estimated) .     | 95,237                | 119,468                      | 2,745                           | 122,212            |
| Dec. (est.) ..                   | 95,300                | 119,930                      | 2,865                           | 122,795            |
| 6 months ending<br>December. . . | 544,313               | 692,970                      | 15,641                          | 708,611            |
| 12 months ending<br>Dec. ....    | 1,046,313             | 1,270,969                    | 27,356                          | 1,298,325          |



**COAL IN 1916.**

The Dominion Department of Mines has received from the principal coal operators in Canada, returns of their production for ten months supplemented in most cases with estimates for November and December.

On the basis of the record available, it is estimated that the total production of coal in Canada during the calendar year 1915 will approximate 14,365,000 short tons (equivalent to 12,825,892 gross tons). The estimate is believed to be fairly close for Nova Scotia and British Columbia. In Alberta, however, there are so many small operators that final returns may show a wider variation from the estimates now made.

By provinces, the estimate is as follows, the figures for 1915 being included for comparison.

**Estimated Coal Production in Canada, 1916—in Short Tons.**

|                     | Production of Coal<br>1915. | 1916.      | Increase or<br>Decrease |
|---------------------|-----------------------------|------------|-------------------------|
| Nova Scotia .....   | 7,463,370                   | 6,950,000  | 513,370                 |
| New Brunswick ...   | 127,391                     | 135,000    | 7,609                   |
| Saskatchewan. ....  | 240,107                     | 260,000    | 19,893                  |
| Alberta. ....       | 3,360,818                   | 4,400,000  | 1,039,182               |
| British Columbia .. | 2,065,613                   | 2,620,000  | 554,387                 |
| Yukon. ....         | 9,724                       | .....      | .....                   |
| Total. ....         | 13,267,023                  | 14,365,000 | 1,097,977               |

The 1916 production exceeded that of the two previous years the increase over 1915 being about 8 per cent. Nova Scotia is apparently the only province that has not made an increased production, the falling off in this province being a little less than 8 per cent. The increase in Alberta is nearly 32 per cent. and in British Columbia nearly 27 per cent. The production in New Brunswick, Saskatchewan and British Columbia is the highest on record. No estimates are available yet as to the Yukon output.

**VIPOND—NORTH THOMPSON MERGER.**

There have been many rumors regarding the basis on which the Vipond and North Thompson companies will be merged. The "Northern Miner" has received information from a reliable source and the basis as set forth in the following paragraphs, is believed to be substantially correct. It will be seen that the North Thompson company will have control over the new company.

The new company is to be capitalized at \$3 000 000. Vipond and North Thompson each receive 1 125 000 leaving 750 000 shares in the treasury. Of this 750,000 shares North Thompson people take 300,000 shares at 60 cents per share, this stock in turn being taken from them by a syndicate at the same price. This leaves 450,000 shares in the treasury of the new company. Of the 1,125,000 shares received by the Vipond, 225,000 shares are given to Mr. Ward in exchange for his bonds on the basis of 40 cents per share. This puts Vipond into the combination free and clear of all debts. Of the 225,000 shares received by Mr. Ward 75,000 shares are taken at 40 cents by the same syndicate that takes the 300,000 shares from North Thompson. This leaves Vipond with 900,000 shares to be exchanged for the present Vipond stock at the rate of share for share.

All the ore being treated in the Vipond mill at present is coming from the North Thompson property. This should make a substantial increase in average mill heads at once. Connections with the Vipond are to be made on the 600 foot level and a crosscut is now being driven at that depth.—Northern Miner.

**ANNUAL MEETING, A. I. M. E.**

New York, Jan. 22.—The programme of the 114th meeting of the American Institute of Mining Engineers, which convenes here February 19th, was made public to-day. Sessions will include the annual business meeting and presentation of papers on subjects of the greatest scientific interest in the mining field. In addition, a number of special social features are being planned, including an all-day excursion by special train to West Point, where the engineers will view a number of exhibitions and inspect the grounds of the military academy.

According to registrations received, this year's prosperity of the mining camps in the Middle and Far West will be reflected in the attendance at the February meeting. Individuals connected with practically all of these will take some part in the technical sessions.

The meeting will extend over four days and will open on February 19th, with sessions on geology, metallography, petroleum and gas, and milling and smelting. On the following day, sessions will be held on iron blast furnace practice on flotation. The principal sessions of the third day will be held on the manufacture of iron and steel.

Among the leading papers which will be presented are: (1) Recent Geological developments on the Mesabi Iron Range, Minn., by J. F. Wolff; (2) Grain Growth Phenomena in Metals, by Henry M. Howe and Zay Jeffries; (3) Evidence of the Oklahoma Oil Fields on the Anticlinal Theory, by Dorsey Hager; (4) Magnetic Concentration of Low Grade Magnetic Iron Ore by S. Norton; (5) The Conservation of Phosphate Rock in the United States, by W. C. Phalen; (6) Potash as a by-product from the Blast Furnace, by R. J. Wvssor; (7) Significance of Manganese in American Steel Metallurgy, by F. H. Willcox.

The committee on arrangements for the convention includes: David H. Browne, chairman; Lawrence Adieks, P. E. Barbour, George D. Barron, Karl Eilers, Louis D. Huntoon, H. A. Megraw, Thomas T. Read, Burr A. Robinson, F. T. Rubidge, E. Maltby Shipp, Bradley Stoughton, Edward B. Sturgis and Arthur L. Walker.

**COBALT SHIPMENTS.**

For the month ending Dec. 31, fifteen northern companies shipped an aggregate of 38 cars of ore, approximating 2,578,426 pounds. Dominion Reduction with six cars, weighing 495,000 pounds, was the leader of the Cobalts, McKinley-Darragh coming second with 330 733 pounds. A summary follows:

| Shipper.                      | Cars. | Pounds.   |
|-------------------------------|-------|-----------|
| Dominion Reduction .....      | 6     | 495,000   |
| McKinley-Darragh . . . . .    | 4     | 336,733   |
| Mining Corporation . . . . .  | 3     | 214,498   |
| Beaver Consolidated . . . . . | 2     | 138,166   |
| Coniagas . . . . .            | 2     | 112,815   |
| Penn-Canadian . . . . .       | 2     | 83,505    |
| Trethewey . . . . .           | 2     | 76,456    |
| La Rose . . . . .             | 1     | 87,390    |
| Buffalo . . . . .             | 1     | 64,934    |
| Hudson Bay . . . . .          | 1     | 61,047    |
| Aladdin Cobalt . . . . .      | 1     | 44,600    |
| Total . . . . .               | 25    | 1,700,144 |

**Other Camps.**

|                                             |    |         |
|---------------------------------------------|----|---------|
| Pittsburg-Lorraine . . . . .                | 1  | 62,642  |
| Miller Lake-O'Brien . . . . .               | 1  | 40,000  |
| Hollinger Con. (gold slag) . . . . .        | 1  | 72,740  |
| Alexo Mining Company (nickel ore) . . . . . | 10 | 694,000 |



### CROWN RESERVE.

"Financial Times" in a recent number published the following article by L. W. L.

The Crown Reserve Mining Company recently gave proof of being still alive by declaring a five per cent. dividend, for 1916, which has since been paid. This dividend came from the profits of the Porcupine Crown—which company the Crown Reserve Company controls—and from the sale of silver in store and disposed of during the year at better prices than could have been obtained if it were sold when produced.

During the year the Crown Reserve Mine just paid its own operating costs. The high price of silver has permitted the mine to produce mill ore and small patches of high grade, to meet the cost of development. About 40 tons of low grade ore per day is at present being treated. As expenses have been reduced to a minimum, the mine is in a position to pay its way, but no large profits are at present to be seen.

The big event of the year, from the viewpoint of the shareholders of the company was the discovery in the development work at the north shaft of the Crown Reserve, where a great deal of work has been done during a protracted period, that there is a large area of conglomerates, which were cut off from the conglomerates which proved so profitable in the original area mined by the Keewatin. As soon as the Keewatin was struck, in the original workings, the values disappeared. This new conglomerate area is now being vigorously prospected, with every chance that something good may be struck, in fact, there is a strong possibility that an entirely new series of ore bodies may be developed. The discovery of this conglomerate area may have an effect on the Silver Leaf property on which the same formation probably occurs. This is all on the North side of the lake, where a shaft was sunk some years ago to the 500 foot level and development work done on a smaltite vein carrying low silver values. Nothing new, however, was discovered during the year in the old Silver Leaf workings.

This property is at present the main asset of the Crown Reserve Company. During the year, the Porcupine Crown developed, on the whole, very satisfactorily. There do not appear to be any ore bodies to the west of the main vein, as the quartz porphyry cuts off the mineralized zone at this point, but the main vein and allied ore bodies have developed very well. The big development in 1916 was the opening up of an ore body between the 800 and 900 ft. level, running \$100 to the ton. This will enable the management to "sweeten" their low grade and materially aid production. During the year the output was maintained, and the cash surplus was increased, after the payment of the usual dividends. The life of this property, like all mining propositions, is limited, but the mine, so far as ore reserves are concerned, is in a better position to-day than it was a year ago.

During the year the Crown Reserve property threw up their working option on the Globe Mine, in California. They found that the property was not developing successfully. Various other options were considered and some taken up, but subsequently abandoned. At present the Crown Reserve Company is developing claims in the Boston Creek district which look promising; and they have a working option on the Cochrane mine in Cobalt, which adjoins the Temiskaming, on the north of the latter property. The

Crown Reserve officers are opening up the Cochrane at depth, as it is reported that the management are of the opinion that heretofore this property has not been prospected sufficiently at depth.

It is quite clear that the future of the Crown Reserve Company, as a permanent investment, depends on the acquisition of further properties, and there is no doubt that the management are leaving no stone unturned to discover properties of merit. Prospects are few. But the shareholders of the Crown Reserve Mining Co. would never have had the valuable Porcupine Crown property, with ore reserves valued at over \$2,000,000.00, if the management had not put into force their policy of examination, acquisition, and development of promising propositions from a legitimate mining view-point.

### CROWN RESERVE.

The annual meeting of Crown Reserve Mining Company was held on Jan. 24, in Montreal. The annual report for the year just ended does not make a very satisfactory showing from a mining point of view, and indicates that the life of one of the most productive silver mines in the Cobalt camp is nearing its close. Gross profits from mining amounted to \$191,822, while mining and milling costs totalled \$188,849, leaving the small net profit of \$2,973. The revenue from investments, the chief of which is the Porcupine Crown stock, amounted to \$145,413. Costs of administration were \$22,487, and dividend disbursements accounted for \$88,440. Silver on hand was estimated at 2,498 ounces.

### PORCUPINE CROWN.

The annual statement of the Porcupine Crown mine as presented at the annual meeting on Jan. 24, in Montreal shows that operating profits for the year ending Dec. 31, 1916, were \$270,430, as against \$299,116 in 1915. The balance carried forward from 1915 amounted to \$269,977, less \$2,536 allowed for readjustments, and interest was shown as \$5,070.

Distribution was made as follows: In dividends, \$240,000; bonuses to employees, \$6,124; war taxes, \$20,793, leaving a surplus of \$297,882.

### GRANBY CONSOLIDATED.

Blister copper turned out from the two smelters of the Granby during the calendar year 1916 amounted to 44,702,164 pounds, a new high record. The growth of the past few years is seen in the following (pounds):

|                |            |                |             |
|----------------|------------|----------------|-------------|
| 1916 . . . . . | 44,702,164 | 1915 . . . . . | 40,670,598  |
| 1914 . . . . . | 22,080,005 | 1913 . . . . . | 21,511,747  |
| 1912 . . . . . | 22,682,001 | 1911 . . . . . | *11,000,599 |
| 1910 . . . . . | 20,017,048 |                |             |

\*Closed several months.

There was a drop of nearly a million pounds in December's copper yield from the previous month's total, due to the failure of equipment companies to make deliveries as promised of parts essential to the full operation of the new auxiliary power plant which Granby installed during the past year at a cost of \$700,000. It was the purpose in making this installation to overcome the effects of severe winter weather which for a month or two made operations impossible at Hidden Creek.



**CLAY PRODUCTS ASSOCIATION.**

Hamilton, Wednesday, Jan. 24.—The Canadian National Clay Products Association opened their 15th annual convention at the Royal Connaught Hotel yesterday. Representatives from all over Canada are present, and it is expected that 250 will be in attendance before the convention is brought to a close on Friday.

The following officers were elected for the ensuing year: President Greaves Walker, Toronto; first vice-president, Thomas Kennedy, Swansea; second vice-president, William Burgess, Todmorden; third vice-president, Ryland H. New, Hamilton; secretary-treasurer, Gordon Keith, Toronto; (re-elected); councillors, C. B. Lewis, (Milton), D. A. Lochrie (Toronto), J. S. McCannell (Milton) H. Desjardines (Montreal), Walter Clark (Corunna), T. H. Graham (Inglewood), and C. A. Miller (Toronto), all re-elected; also one new member, G. A. German, Toronto.

J. Edward Frid of Hamilton, retiring president of the association, made the opening address, and the delegates were welcomed to the city by Mayor Booker. During the afternoon the ladies were given a motor trip through the city, while a number of papers relative to the clay industry were read at a short business session.

**THUNDER MINING CO., LIMITED.**

In submitting a report to the shareholders of the Wettlaufer Lorrain Silver Mines, Limited, President Henry Lockhart, jr., says:

"With respect to the option which was held by this company jointly with the Kerr Lake Mining Co., on the properties of the St. Anthony Gold Mining Co., Limited, at Sturgeon Lake, Ont., referred to in last year's annual report, your company did considerable exploration work on these properties in conjunction with the Kerr Lake Mining Co., Limited, this company bearing one-third of the expense. Your directors later decided that your company participate in the venture only to the extent of a tenth interest, and a new corporation was formed under the name of the Thunder Mining Co., Limited, in which corporation the title to the property is now vested. In due time your company will receive shares in this new company representing its interest."

**MURRAY-MOGRIDGE.**

Extensive plans for the development of Murray-Mogridge have been outlined, to be started immediately. These include the sinking of present shafts to greater depths, and developing the vein from various levels. The company already has on the property an adequate set of camp buildings, and for the past three months a force of men have been at work. Development to date has been confined to one vein upon which shafts have been sunk a distance of 2,000 feet apart to a depth of 50 feet. Arrangements have already been made regarding machinery and equipment for the aggressive campaign of development proposed.

The development of this property will be watched with much interest. The property consists of approximately 400 acres, situated on Wolfe Lake in the Sese-kinika Lake District, and of this acreage only a fraction of an acre has been prospected. The work already done has put in sight some commercial ore, the values of which are very consistent. A recent sampling gave average values of \$10.05 per ton.—Northern Miner.

**SULPHURIC ACID IN 1916.**

The production of sulphuric acid in the United States in 1916 was much greater than in 1915. The estimated production of sulphuric acid of strengths of 50 degrees, 60 degrees, and 66 degrees in 1916, expressed in terms of 50 degrees acid, is 4,475,000 tons an estimated increase over the production in 1915 of 600,000 tons, or more than 15 per cent. The increase was distributed about equally between acids of strengths of 50 degrees and 60 degrees, as there was a small decrease in the production of acid of strength of 66 degrees.

The most notable feature in the sulphuric acid industry was the enormous increase in the production of acids of strengths greater than 66 degrees. The estimate shows a production of these stronger acids of over a million tons as against a production of less than 200,000 tons in 1915. It is not feasible to express the amount of these higher acids in terms of 50 degrees acid; therefore the total given for them is in addition to the total given for acids of strengths of 66 degrees or less.

The estimated output of acids of strengths of 60 degrees and 66 degrees includes by-product acid produced at copper and zinc smelters. The output of acid so produced in 1916, expressed as 60 degrees acid, amounted to nearly 950,000 tons, or practically the same as in 1915. However, over 110,000 tons of acid of higher strengths was produced at these smelters, a quantity nearly double that produced in 1915.

The market conditions throughout the country are reported to have been on the whole better than in 1915, and the value of the product will probably be somewhat higher than it was even during that year of high prices.

The estimates are based on returns received by Philip S. Smith, of the United States Geological Survey, Department of the Interior, from more than 95 per cent. of the producers and on estimates of the outputs of the rest. It is believed that the figures are reasonable and that they will approximate very closely the final figures, which will be made up when the complete returns are received.

**THE DEUTSCHLAND'S CARGO.**

The Toronto Star, in a cable from London, signed by F. A. McKenzie, its correspondent, says:

"The following authoritative statement in regard to nickel sales has been issued: 'Canadian nickel was sold in the United States through the International Company only to firms signing a stringent guarantee against reselling for exporting. The precautions taken thereunder for supervision by the British and Canadian Governments proved satisfactory in every case save one, when the firm broke its bond and despatched a consignment of nickel through the Deutschland. This breach of faith was soon discovered. Any ordinary vessel would have been intercepted before reaching Germany. Immediate steps were taken, which, it is believed, render further breach impossible. Export of nickel from the United States is finally controlled by British officials, not the Mertons. Two certificates are necessary from the British Consul-General in New York and the British War Trading Department before exportation. Certificates are granted only after the most careful investigation of consignees. They are pledged not to resell.'"



## A NEW ELECTRIC STEEL PLANT

Toronto, Jan. 16.—A \$3,000,000 munitions plant for the Imperial Munitions Board is to be located on the new industrial site in Ashbridge's Bay. Yesterday the Toronto Harbor Commission completed the arrangements, and construction work will commence forthwith. It is stated that the plant will finally occupy sixty acres of the reclaimed land.

The plant will have an initial capacity of 300 tons a day. It will be erected to do electrical steel and forging work. The agreement was reached after a conference between the Harbor Commission and Mr. J. W. Flavell and Colonel Carnegie of the Imperial Munitions Board.

In a statement handed out by the Harbor Commission last night it was stated that there will be ten 6-ton 3-phase 25-cycle Heroult type electric-furnaces. Each furnace will consume about 2,000 horse-power. This power will be supplied by the Hydro-Electric Commission.

"It is expected that the ultimate use of the plant for commercial industry will require sixty acres of ground, with modern dockage and rail facilities all of which is being furnished in the Toronto Harbor industrial district in the vicinity of Cherry street.

"The plant will require from 800 to 1,000 men to operate it, and work will be started in connection with the foundations and erection of buildings on Thursday or Friday of this week, and it is expected that the plant will be in operation in July.

"The Toronto Harbor Commissioners are placing their entire Engineering and Construction Department organizations at the disposal of the Munitions Board."

### TORONTO'S NEW STEEL PLANT.

Toronto, Jan. 30.—The Toronto Harbor Commission is wasting no time in getting the reclaimed portion of Ashbridge's Bay, at the foot of Cherry street, ready for the erection of the new steel plant for the Imperial Munition Board. Last Monday the work on the new railroad loop to serve the plant was started, and already a mile and a half of the metal has been laid. Yesterday there were 193 men clearing the site, laying water mains and preparing for the foundation. Pile drivers are being erected, and will be ready for the steel piling for the cement foundations. The harbor board will probably have to wait for steel as the pile drivers are about ready. As soon as the clearing is finished the ground will be broken for the cement foundations, and little difficulty should be experienced in this work.

### TORONTO'S STEEL PLANT.

Commenting on the announcement that an electric steel plant is to be erected at Toronto "Iron Age," says:

An interesting development, showing intense efforts to increase Canadian output, is contracts closed by Imperial Munitions Commission for Canada for ten 8-ton Heroult electric furnaces for a plant to be built at Toronto, and to operate on scrap steel of munitions works. Several months will elapse before steel can be made, but the contract points to indefinite continuance of demand for war steel. These furnaces might add 100,000 tons a year to Canada's steel supply.

Canadian roads must come to this side for rails, as

the two mills there are filled up on steel for the war. For the Grand Trunk, on both sides of the line, 50,000 tons has come up at Chicago, where total inquiries are about 200,000 tons, including 25,000 for government line in Alaska. Chile has bought 5,000 tons, and for Anaconda's operation in Peru 9,000 tons has been placed.

### THE CANADIAN STEEL INDUSTRY.

Conditions in the Canadian steel industry have radically changed since the outbreak of war, whether due to artificial causes or not. These companies never had a proper provision of working capital, and never had the ambition or the opportunity to break into the export trade on aggressive lines. They were tied hand and foot by the banks, through excessive borrowings, and generally were considered as provincial one-horse shows.

One manufacturing company in Canada was in the habit of buying its lathes in the United States. When this company secured war orders the management tried in vain to purchase lathes in the States, and, in a moment of desperation, decided to try and make the machines themselves. So successful were they that they already have produced nearly 60 of these valuable machines. The same company got an order from the War Office for some hay presses, but what did they know about hay presses? Nothing! But they made the hay presses. And one of the officers of the company told me that they would not hesitate to build battleships if they got the chance. And he meant it.

A great change has come over our industrial operators since they have been thrown out of the beaten rut. Nothing will "Phase" them, and when the business of making tanks, shells and other war material has been suspended, the Canadian steel industry will be heard from in its ability to manufacture all kinds and conditions of material required abroad.

The steel companies have their treasuries full to overflowing with cash, and they owe the banks nothing.—Financial Times.

### COKE OVENS FOR SYDNEY.

The Sydney "Post" reprints and gives prominence to the following item which was published some time ago in Pittsburgh:

"Announcements by officials of the H. Koppers Company, a local by-product ovens company, indicate that negotiations are now under way between themselves and the Dominion Iron & Steel Company, of Sydney, Nova Scotia, for the construction of a large number of by-product coke ovens which, it is said involve a sum between \$2,500,000.00 and \$3,000,000.00. The ovens will be erected at Sydney, Nova Scotia, it was stated, but when work will begin is not known at present.

"The Dominion Iron & Steel Company, through extensive contracts, has need for the by-product ovens, it was stated. They will be built on the most improved plans, that the by-products from the coke can be extracted to full advantage.

"The Koppers Company is one of the largest concerns of its kind in the world and has received some of the largest contracts let recently for the erection of by-product ovens. To handle the Canadian order the local concern is arranging to increase their already large force for the work necessary on the plans."



### THE COAL SHORTAGE.

The increased consumption of bituminous coal by the railroads and industrial interests of the country during 1916 brought about a condition in which the demand for coal was greater than the ability of the railroads to deliver it, and in some localities greater than the ability of the mines to produce it, because of scarcity of labor. There is no lack of coal in the ground, or of mines from which it can be obtained. The soft-coal mines, however, are not equipped to store coal that has been mined, and the coal must be loaded into railroad cars as soon as it is dug—in fact, the miners as a general rule do not go into a mine unless the cars are on hand to take the day's output.

The greater part of the bituminous coal produced in 1916 was sold on contracts at prices (agreed upon during the early part of the year) that represented increases little if any more than the increases in wages granted to the miners. The high prices at which the small quantity of coal not contracted for was sold during the last three months of the year were the result of excess of demand over supply. The buyers bid the price up, and as happens in the marketing of any article or commodity under like conditions, there was doubtless some speculative holding and trading that tended to raise prices. This factor and the inclination of the middleman and retailer to extract extra profits are not believed to have been any greater as regards coal than as regards other necessities whose prices have risen during the last few months.

The production and consumption of coal in the United States in 1916 broke all records, according to C. E. Leshner, coal statistician of the United States Geological Society, Department of the Interior. The quantity of bituminous coal mined last year is estimated as slightly more than 509 000 000 net tons, an increase, compared with the output in 1915, of more than 66 500 000 tons, or 15 per cent., and compared with the previous maximum, in 1913, of 31 000 000 tons. Data furnished by the Anthracite Bureau of Information indicate that the production of Pennsylvania anthracite was 88 312 000 net tons, about 600 000 tons less than in 1915. The total output of coal in the United States is thus estimated at 597 500 000 net tons, and the final figures when compiled may show 600 000 000 tons, compared with 570 000 000 tons in 1913.

### AETNA EXPLOSIVES.

Aetna Explosives directors have passed the quarterly dividend of 1 3/4 per cent. on the preferred stock due at this time. The dividend has been paid regularly since April, 1915. No action was taken on accepting the resignation of President Kimball, and he will continue as president for the time being. It has been rumored for some time that the dividend would be passed, as the company was in need of working capital and, while the dividend was earned, it was decided to conserve the money for operation of the plants. Two plants which have been closed for some time, one of them the Drummondville, Quebec, plant, have recently been placed in operation, thus creating further demands on working capital. According to one of the directors the company, as of December 1, last, had net quick assets of \$11 000 000 and quick liabilities of \$5 000 000, leaving working capital of 6 000 000.

### VANADIUM STEEL.

It may sound extreme to say that the phenomenal development of the Ford Motor Co., was due to a smash-up at the automobile race at Palm Beach in 1905, and yet there is much truth in this statement.

At that race (one of the entrants was a Ford model "K," a high-powered six-cylinder car), a French car met with a serious accident, and after the smash-up Mr. Ford picked up a valve stem. The head of the Ford Co. marvelled at its lightness and strength. No one knew of what it was made. Ford said "we should have that kind of material in our cars if we're going to lead."

It was vanadium steel, and vanadium steel means meeting a 3,000 degree F., a temperature at which practically every furnace in this country at that time would melt itself.

The Ford Times for December continues the story as follows: "The United Steel Co. of Canton, O., (now the United Alloy Steel Corporation), which makes practically all of Ford vanadium steel, was at that time a concern struggling between competition of the larger companies. Mr. Ford told them: 'If you will run a heat for us and see if we can get vanadium in there, I'll guarantee any losses which may occur.' That heat cost several thousands of dollars and was lost, but Mr. Ford was convinced it could be done—and the second test was a success."

The result was that steel with a tensile strength of 170 000 pounds was available instead of 60 000 to 70 000 pounds.

The light Ford car was then a possibility, and the United Alloy Steel Co's future was assured.

The Ford Co. is now making and selling 750 000 cars a year, and the United Alloy Steel Corporation to supply the needs of the automobile, railroad, equipment and other industries, has increased its capacity to 60 000 tons a month.—The Wall Street Journal Straws.

### IMPERIAL OIL.

Imperial Oil of Canada's spectacular advance to 350, establishing a new high record, is in a class all by itself. The stock does not enjoy the wide interest that surrounds a listed security. Canadian transactions are few. New York, however, is ever on the alert and odd lots find ready buyers. As the dividend is 8 per cent., an explanation of present high price of the shares is believed to lie either in substantial increase in the dividend or the cutting of another "melon," as a year ago. The Imperial Oil Company is the Canadian subsidiary of the Standard Oil Company, whose "policy of silence" is world renowned. In March 1916, the Imperial Oil Company placed its \$22 000 000 stock on an 8 per cent. basis. The preceding semi-annual dividend was 6 per cent. on \$11 000 000 stock. In January, 1916 the company distributed a stock dividend of 100 per cent.—Financial Times.

### CENSUS OF TECHNICAL MEN.

The Joint Committee of Technical Organizations (Ontario Branch) is sending out letters to some 2 000 technical men, explaining in detail the organization and the aims of the committee. Every technical man in the Province of Ontario who does not receive such a letter during the week ending February 3, is requested to communicate immediately with the secretary, Room 910, Excelsior Life Building, Toronto.



## DOMINION STEEL CORPORATION LTD., IN 1916

Notwithstanding the serious reduction in one important branch of the business of the Dominion Steel Corporation, which will be referred to under its proper heading, the past year may be regarded as the most successful in the history of Sydney's greatest industrial organization.

During the whole year operations have been prosecuted with the greatest possible activity, and, with the exception already noted, to the full extent of the capacity of the various works controlled by the corporation. While no statement has been furnished of the financial results, it is generally understood that these exceed those of any former period. Larger amounts have been disbursed for wages than ever before and the earnings of individual employees are at the highest level ever reached.

In service to the Empire the corporation has played its part in furnishing materials for the manufacture of munitions and coal for use of transports and troopships, as well as by the personal services of thousands of its employees, many of whom can never return to their homes beside the sea and to their accustomed places in mine or mill.

### Changes in Higher Offices.

Some notable changes have occurred in the higher offices of the corporation and its constituent companies.

In January Mr. J. H. Plummer, much to the regret of those who had worked with him and under him during the long period of his connection with the Steel and Coal companies, resigned the presidency of the corporation, and was succeeded by Mr. Mark Workman, who has been a member of the board over which he now presides, since the stormy days before the merger of the companies. Mr. Workman has long held a prominent place in business and financial circles, and has brought to his new task qualities of mind and character that cannot fail to make a marked impression on the future of the corporation.

On the first of March, Mr. D. H. McDougall, who for several years had been general manager of the Coal company, was appointed to the same office in the Steel company, and so became the chief executive officer of the corporation in respect to the operation of all its constituent companies.

### Dominion Coal Co., Limited.

A resume of the coal trade of 1916 and the past decade was published in the Jan. 15 issue of this journal, and need not be mentioned here.

### Dominion Iron and Steel Co., Limited.

The conditions prevailing at the close of 1915 have not materially changed, except that a slightly larger proportion of the company's output has been absorbed for domestic use, and the production of materials for munitions has greatly increased. Exports of rails were considerably less than in the preceding year, but exports of other materials, such as wire rods, barbed and plain wire and wire nails have been maintained upon the same generous scale that was established in 1915.

The output of pig iron and ingots, which may be taken as a fair measure of the operations of the works, were larger than those of the previous year by about 12½ and 6 per cent., respectively. The tonnage of ingots produced is the largest attained in any calendar year in the company's history.

The figures in the following table of outputs are approximate, having been made up some days in advance of the close of the year:

|                                       | Tons.   |
|---------------------------------------|---------|
| Pig iron .....                        | 348,000 |
| Steel ingots .....                    | 376,000 |
| Blooms, billets, etc., for sale ..... | 150,000 |
| Rails. ....                           | 17,495  |
| Wire rods .....                       | 112,400 |
| Merchant bars .....                   | 9,950   |
| Wire and products of wire .....       | 47,500  |

The ore mines at Wabana and the Limestone and Dolomite quarries in Cape Breton and Newfoundland were kept in active operation during the summer months, and some work was done during the winter in the ore mines. The quantities produced are as follows:

|                              | Tons.   |
|------------------------------|---------|
| Iron ore .....               | 805,000 |
| Limestone and dolomite ..... | 471,000 |

### Improvements, Extensions, Etc.

Large expenditures have been made during the year for improvements and extensions of plant, as well as for renewals. The principal items of new construction were for purposes related to the production of shell steel, and include the installation of a third Bessemer converter, the erection of a 250 ft. extension to one of the mill buildings for the housing of a battery of heavy steel cutting machines and the addition of a large number of smaller machines for the same purpose in other existing buildings. The facilities for recovery of benzol and other hydrocarbons were further increased and improved.

In the blast furnace department arrangements have been made for the rebuilding of No. 1 furnace on larger and more modern lines. A new electric driven ore bridge is being erected over the stock yard and the stock bins have been thoroughly overhauled and renewed.

In the open hearth department, in addition to a number of lesser improvements and renewals, eight of the big furnace stacks have been completely rebuilt.

In the mills and yards new cooling beds have been erected, new tracks laid and new locomotive cranes provided to cope with the increasing tonnage which has to be handled.

A contract has just been concluded for the erection of a number of coke ovens of the most modern design, which, when complete, will increase the output of coke and make possible a larger production of pig iron.

### Outlook.

Prospects for the new year, so far as can be judged at the present time, are hopeful.

The volume of the coal trade will be limited, chiefly by the shipment facilities, and to a lesser extent, by the number of men available, but this limitation will diminish as new men become more expert in the work of mining.

The tonnage of steel on order is sufficient to keep the works actively employed for several months, and so far there is no indication of any slackening in the demand for all the materials that the company can produce.

### BOSTON CREEK.

The O'Donald group of claims comprising approximately 190 acres between the Boston Creek gold mine and Boston Hollinger property, was placed under option to Mr. H. J. Stuart, representative of the Crown Reserve Mining Company of Cobalt. The option price is a large one. A force of men have already commenced surface work, and erection of camp buildings, preparatory to carrying on an extensive development campaign. The main veins of the Boston Creek, the R. A. P. Syndicate, and the Boston Hollinger are in evidence on the O'Donald property.—Northern Miner.



**HOLLINGER CONSOLIDATED.**

The very aggressive exploration and development campaign which is being conducted by the management of the Hollinger Consolidated is resulting in the discovery of more new ore bodies, and proving up to a still greater extent the bodies already known to exist. The growth of these ore bodies in length and depth keeps pace with the rapidly lengthening drifts, raises and winzes.

On the Aeme side, adjacent to the McIntyre line, the large ore bodies at the 800-ft. level are proving highly satisfactory as development work proceeds.

A 900 foot crosscut that will tap all the area lying west of Pearl Lake is being driven from number eleven shaft to number twelve shaft. The area through which this crosscut will pass has, owing to the heavy overburden, never been explored on the surface, and it is considered quite probable the underground field of mining will be greatly broadened by this operation.

On the 425-foot level, which will continue to be the main haulageway of ores for at least another two years, considerable opening up and extending of works has been accomplished with very favorable results. A very important vein, which is known to be over 1,000 feet in length on surface, but which had not been hitherto tapped underground, has been cut in an east crosscut on this level, where it contains average values of \$12 per ton across a width of seven feet.

Another very important development has been that of opening up the vein under Miller Lake. This vein which is also seven feet in width, is being drifted on. Up to the present three hundred feet of high-grade ore has been opened up, and the drift is still in ore.

The central shaft equipment is nearly all completed and the big electric hoist is being set up. Also at the 425 foot level, a large electrical pump has been installed. This displaces the seven air pumps which have hitherto been employed at this level, and thereby cuts out a large air consumption which can in the future be used to better advantage in other directions.

The mill extension is being pushed rapidly forward. The cyanide end is completed, and the tanks are now being placed. The main mill building is also completed, and the machinery is in the course of installation. The transportation of ore from the central shaft, including four ore storage pockets, is about completed, only the trestle work yet remaining to be connected to the mill.

The Hollinger is developing at a depth of 1,250 feet. At the 425 foot level over a mile of tramway is operated by electricity. Approximately 1,300 men are on the company's pay roll.—Cobalt Nugget.

**AURUM MINES, LIMITED.**

Toronto, Jan. 30.—At a meeting of the Aurum Mines, Limited, the following were elected as first permanent directors: President, Sir H. Pellatt; vice-president, Col. J. B. Miller, president Polson's Iron Works; W. B. Reid, president United Cigar Stores; E. J. Blackman, manager Dodds Medicine Co., and A. H. Jaffray, assistant manager Polson Iron Works. The Aurum claims adjoin the celebrated Croesus property in Munro Township. Camps have been erected and one shaft is down 25 feet. The vein was three feet wide on the surface but had widened to five feet at the 25-foot depth. No offering of the company's shares is to be made at present.

**DOMINION COPPER PRODUCTS.**

The plant of the Dominion Copper Products Company at Lachine was built last winter to supply the copper and brass parts of ammunition, and when peace is declared we may expect it to continue to manufacture, but for other purposes, copper and spelter that has been mined, smelted and refined in Canada. An illustrated description of this plant by Mr. L. J. Krom appears in the November number of The Metal Industry from which the following notes are taken.

The plant was built last winter, and was put in operation only eight months from breaking the ground, a very creditable performance as it was impossible to buy much of the machinery, which was therefore made in the works. The plant contains a casting shop with one hundred crucible furnaces for melting copper and brass. In this shop are cast the copper tubes for making driving bands for small shells and brass bars for the manufacture of cartridge cases. From the casting shop the metal goes to the tube mill and brass rolling mill. Here are placed the drawing presses, rolls, annealing furnaces, 'overhauling' machines, saws, pickle tubs and other appliances. In another building is a reverberatory furnace for refining scrap copper, and a casting machine. Here is also a 1,200-ton press for piercing and drawing into tubes the copper billets made from this furnace. In addition to the above is a large building provided with lathes for cutting copper bands from the seamless tubes and presses for cutting cartridge disc from the sheets of brass. The ashes from the casting shop are treated in a separated building to recover the metal contents.

The executive of the Company includes Mr. G. H. Duggan, President; Mr. H. H. Vaughan, Vice-President and General Manager, and Mr. F. Deming, General Superintendent, while Messrs. T. West and F. Gardner late of the Metallurgical Department of McGill University have charge of the chemical and metallurgical interests of the plant.

**LAKE SHORE.**

According to the "Northern Miner" another issue of Lake Shore treasury stock will be made. The money received from the issue will be to carry on a more active development campaign and help pay the cost of building the mill, a proposal for 1917. In fact it is understood that the plant has been ordered.

On the property a shaft has been sunk to the 300 foot level, at which depth over 600 feet of drifting, 160 feet of crosscutting and 36 feet of raising has been done during the past year, and on the 100 foot level over 100 feet of drifting. Some veins showing excellent values have been uncovered, assays averaging \$18 a ton, and it is estimated that over 300,000 worth of ore has been put in sight above the 300 foot level during the last year. The company has spent \$82,102 on development work.

**DOMES.**

To provide for mill extensions that will increase the output and decrease the average cost of production per ton, the Dome Mines Co. are planning to issue about \$500,000 worth of the treasury stock now unissued. There is a million dollars worth par value of stock now in the treasury, and less than half of this will be taken to close the option on Dome Extension, which latter is generally regarded as a foregone conclusion.



### UTICA MINES, LTD. BRITISH COLUMBIA.

The Utica Mines, Limited, operating the Utica group of ten claims, seven miles from Adamant siding on the Kaslo-Slocan branch of the Canadian Pacific railway, British Columbia, has enjoyed a prosperous year and is now in such physical and financial shape that a long period of profitable operation seems assured. Shipments for the year were 983 tons of silver-lead ore, averaging about 22 per cent lead and 170 ounces silver to the ton and 75 tons of zinc ore averaging approximately 43 per cent zinc and 145 ounces silver. The property is developed by 3,600 feet of drifts on the vein and 550 feet of crosscuts. The deepest level is 1,200 feet below the outcrop at the top of the ridge, and at this depth the vein has been developed with most satisfactory results. Another level, about 350 feet vertically lower, was started two months ago and will be driven to the vein during the winter. Ore is being stoped from two levels. Utica Mines, Limited is capitalized for \$2,000,000 in \$1 shares, its largest shareholders being George H. Ayland of Victoria, B. C., president and managing director of the Standard Silver-Lead Mining company, and Charles F. Caldwell of Kaslo, B. C. The company is said to hold a cash reserve of approximately \$40,000.

The British Columbia correspondent of the Canadian Mining Journal writes: Two erroneous statements printed recently in several British Columbia newspapers are (1) that the total amount of dividends paid by the Hedley Gold Mining Co. in the last five years was \$780,000, and (2) that the increase in ore receipts at the Consolidated Mining and Smelting Co's smelting works at Trail, B. C., in 1916 as compared with those of 1915 was 17,572 tons. As to the former, the total of dividends paid during five years, 1912-1916, was \$1,560,000, which is just twice as much as that given in the New York story reprinted in British Columbia. Then, the total quantity of ore received at the Trail smelter in 1916 was 486 688 tons, while that in 1915 was 441,085 tons, according to figures given in the statements of ore receipts for those years, respectively, supplied weekly by the company. The increase for 1916 over 1915 was, therefore, 45,603 tons, or a little more than ten per cent.

The United States Bureau of Mines, Washington, D. C., is compiling a new glossary of mining terms, and in order to have it complete sixty different glossaries have been studied and selections from them are being embodied in the new compilation. The glossary which will be published eventually by the Bureau of Mines, will also include a lengthy list of Spanish mining terms.

The result of the election held recently by members of United Mine Workers of America, District 18, which has jurisdiction over many of the coal mine workers in the Province of Alberta and the Crowsnest district of British Columbia, was announced at Fernie, B. C., on January 9, as follows: President, W. G. Graham; secretary-treasurer, A. J. Carter; international representative, David Rees. The district board members are: W. Sherman, Fernie, sub-district No. 1; J. Johnston, Coleman, Alberta, sub-district No. 2; C. J. Phillips, Coalhurst, Alberta, sub-district No. 3; Frank Wheatley, Bankhead, Alberta, sub-district No. 4.

### BOOK REVIEWS.

**THE WORLD'S MINERALS.** By Leonard J. Spencer. Frederick A. Stokes Co., New York, Price \$2.75. For sale by Book Department, Canadian Mining Journal.

This book is for the most part devoted to the description of 116 species of the more common minerals. Colored illustrations of 163 specimens are given and assist the text greatly. The aim of the author is to draw attention to such of the more prominent characters as will help the student to identify miners. Mention is also made of the uses of the chief minerals.

**THE FUNDAMENTAL PRINCIPLES OF PETROLOGY.** By Dr. Ernst Weinschenk. Translated by Albert Johannsen, McGraw-Hill Book Co., 1916. Price \$2.50. For sale by book department, Canadian Mining Journal.

Dr. Weinschenk's elementary treatise has been for some years recognized as one of the most useful for those beginning the study of petrology. The translator has rendered a distinct service by making the work accessible to a larger number of English speaking people.

**PRINCIPLES OF OIL AND GAS PRODUCTION.** By Roswell H. Johnson and L. G. Huntley, John Wiley & Sons, 1916. Price \$3.75. For sale by book department, Canadian Mining Journal.

This is a discussion of the subject with reference to American conditions. The authors have attempted to treat more fully the newer, less developed topics and less fully those that have a literature. Methods of locating and extracting oils are given prominence.

**SILVER AND GOLD. A pictorial Souvenir of the Mines of Northern Ontario, The Cobalt Daily Nugget, 1916.**

This is a well illustrated booklet devoted to silver and gold mining industry. An introduction summarizes briefly the record of Cobalt and Porcupine. The greater part of the book is made up of reproductions from photographs of mining properties. A brief account is given of the operations of the several companies.

**FIELD GEOLOGY.** By Frederic H. Lahee. McGraw-Hill Book Co., 1916. Price \$3.00. For sale by book department Canadian Mining Journal.

The author has aimed to write a book that will be useful not only to students of geology, but also to engineers whose interests bring them into touch with geologic problems. An elementary knowledge of geology on the part of the reader is assumed.

Attention is directed to means of recognizing and interpreting geologic structures and topographic forms. A number of keys and tables are presented to assist the observer in identifying various forms and structures. Methods of geologic surveying, the nature and construction of maps, etc., are discussed in some detail. An appendix contains several useful tables and other data in form convenient for reference.

At a meeting of the shareholders in the Noonday Mines Co., operating the Noonday Silver-lead mine, situated near Cody, Slocan district of British Columbia, Mr. Bruce White of Sandon, Slocan, was elected president of the company; Mr. R. C. Tammars, of Spokane, Washington, vice-president; Mr. John B. White, also of Spokane, treasurer, and Mr. H. S. Burdick a director.



**FATALITIES IN BRITISH COLUMBIA MINES.**

Three men were killed in collieries during the last quarter of 1916, compared with five in 1915. Fatalities in coal mines in 1916 totalled 28, against 52 in 1915.

Fatalities in collieries in 1916 were: Canadian collieries (Dunsmuir), Ltd., Cumberland, 6; Pacific Coast Coal Mines, Limited, South Wellington and Morden, 2; Fuel Co., Nanaimo, 3; Crows Nest Pass Coal Co., Coal Creek, 5; Crows Nest Pass Coal, Michel, 12. These 12 lives were all lost in the one accident at Michel in August.

Cause of deaths in coal mines were: By falls of rock and roof, 7; by falls of coal, 3; by mine cars and haulage, 5; by asphyxiation in mine gases, 1; by explosion, 12. None was killed on the surface during the year.

Number of men killed in the metal mines of British Columbia during the final quarter of 1916 was six, one less than in the corresponding quarter of 1915. The total for the year was 20, four more than in 1915.

Metal mines at which fatalities occurred in 1916 were: Iron Mask, Kamloops, 1; Granby, Phoenix, 4; Granby, Anyox, 5; Britannia, Howe Sound, 5; Silver Queen and Ruby, Atlin district, 1; Le Roi, Rossland, 1; Hewitt, Slokan, 1.

The number of deaths in metal mines from the various causes: By falls of ground, 6; by falling into chutes, winzes, etc., 2; by cage in shaft, 1; by mine cars and haulage, 2; by asphyxiation from powder fumes, 2; by returning on unfired shot, 1; by premature blast, 2; by electricity, 1. One was killed on the surface by being hit by flying rock and two from being struck by broken compressed air pipe.

**PORCUPINE CROWN.**

At present mining operations at Porcupine Crown are centred largely in drifting on the 800-ft. and 900-ft. levels. Development of these levels has proven quite satisfactory. Also at the 200 foot level, considerable opening up has been done with satisfactory results.

During the year the mine outgrew its milling equipment, making it necessary to install a new primary crusher and also a new main hoist. The 20 stamps are now able to handle a maximum of 180 tons daily. The general average being around 150 tons. Approximately 120 men are employed at the Porcupine Crown.—Cobalt Nugget.

**PORCUPINE IN 1916.**

In an article written for the Toronto Globe, Mr. Arthur A. Cole says:

"The general development in the Porcupine camp has been very satisfactory. Besides considerable additions to the ore reserves of the two larger properties, the Hollinger and the Dome, the year has been noteworthy on account of the important ore bodies located on the 1,000-foot level of the McIntyre Extension, the 100-foot level of the Schumacher, and between the seventh and ninth levels of the Porcupine Crown, in all cases adding materially to the value of the mines."

"The properties making up the production of nine million dollars in 1916 were: Hollinger, Dome, McIntyre, Porcupine Crown, Vipond, Schumacher and Dome Lake."

"Around these producers a considerable number of promising prospects are being tested out by diamond drill or mining, and besides these, many others are operating both in Deloro and Shaw, and some activity

is also shown to the north of Porcupine Lake. From this development work we may expect to have several more mines added to the list of producers within the next twelve months. Considering present war conditions, it is remarkable that so much activity is being shown in this district, and if the times were normal this would soon assume the proportions of a boom."

**DIVIDENDS FROM NORTHERN ONTARIO GOLD AND SILVER MINES.**

The dividend record of gold and silver mining companies operating in Northern Ontario, as shown in a recent number of the "Northern Miner" is as follows:

**Dividends paid in 1916—**

|                         |                |
|-------------------------|----------------|
| Cobalt . . . . .        | \$4,958,650.84 |
| Porcupine . . . . .     | 8,920,000.00   |
| Kirkland Lake . . . . . | 260,750.00     |

**\$9,139,400.84**

**Dividends paid to date, December 31st, 1916—**

|                         |                 |
|-------------------------|-----------------|
| Cobalt . . . . .        | \$67,318,853.13 |
| Porcupine . . . . .     | 8,922,000.00    |
| Kirkland Lake . . . . . | 325,937.50      |

**\$76,566,790.63**

**Dividends paid by Cobalt mines to Dec. 31st, 1916—**

| Mining Company.                         | Amount of Dividends and Bonuses paid during 1916. | Total Amount of Dividends paid to Dec. 31st, 1916. |
|-----------------------------------------|---------------------------------------------------|----------------------------------------------------|
| Beaver . . . . .                        | \$ 60,000.00                                      | \$ 650,000.00                                      |
| Buffalo . . . . .                       |                                                   | 2,787,000.00                                       |
| Caribou Cobalt (Drummond)               |                                                   | 225,000.00                                         |
| Casey Cobalt . . . . .                  |                                                   | 203,249.33                                         |
| City of Cobalt . . . . .                |                                                   | 139,321.42                                         |
| Cobalt Central . . . . .                |                                                   | 192,845.00                                         |
| Cobalt Lake . . . . .                   |                                                   | 465,000.00                                         |
| Cobalt Silver Queen . . . . .           |                                                   | 315,000.00                                         |
| Cobalt Townsite . . . . .               |                                                   | 966,726.31                                         |
| Coniagas . . . . .                      | 600,000.00                                        | 8,440,000.00                                       |
| Crown Reserve . . . . .                 |                                                   | 6,102,399.30                                       |
| Foster . . . . .                        |                                                   | 45,774.00                                          |
| Hudson Bay (Temiskaming and Hudson Bay) |                                                   | 1,940,250.00                                       |
| Kerr Lake (Holding Co.)                 | 600,000.00                                        | 6,570,000.00                                       |
| LaRose (Holding Co.) . . . . .          | 299,725.40                                        | 6,891,708.59                                       |
| Mining Corporation . . . . .            | 570,615.00                                        | 1,348,740.00                                       |
| McKinley Darragh Savage                 | 269,723.04                                        | 4,876,474.30                                       |
| Nipissing Mines Co. . . . .             | 1,500,000.00                                      | 15,340,000.00                                      |
| (Holding Co.)                           |                                                   |                                                    |
| Peterson Lake . . . . .                 | 168,127.40                                        | 420,318.50                                         |
| Right of Way Mines . . . . .            | 16,855.00                                         | 235,965.00                                         |
| Right of Way Mining Co.                 |                                                   | 324,643.93                                         |
| Seneca Superior . . . . .               | 598,605.00                                        | 1,579,817.20                                       |
| Timiskaming . . . . .                   | 225,000.00                                        | 1,684,156.25                                       |
| Trethewey . . . . .                     | 50,000.00                                         | 1,111,998.50                                       |
| Wetlaufer . . . . .                     |                                                   | 637,465.50                                         |
| Private Corporations . . . . .          |                                                   | 3,825,000.00                                       |

**\$4,958,650.84      \$67,318,853.13**

**Dividends paid by the Porcupine and Kirkland Lake gold mines to December 31st, 1916—**

| Mining Company.                 | Amount of Dividends and Bonuses paid during 1916. | Total Amount of Dividends paid to Dec. 31st, 1916. |
|---------------------------------|---------------------------------------------------|----------------------------------------------------|
| Dome Mines . . . . .            | \$ 800,000.00                                     | \$1,200,000.00                                     |
| Hollinger Gold Mines . . . . .  | 2,880,000.00                                      | 7,050,000.00                                       |
| Porcupine Crown Mines . . . . . | 240,000.00                                        | 660,000.00                                         |
| Rea Mines . . . . .             |                                                   | 12,000.00                                          |
|                                 | <b>\$4,180,750.00</b>                             | <b>\$9,247,937.50</b>                              |



### "ALIEN" OWNERSHIP IN BRITISH COLUMBIA.

Northwest Mining Truth, published in Spokane, Washington, which city is the headquarters of a number of mining companies operating in Kootenay district of British Columbia, last month printed the following:

Mining Truth devoutly hopes that the new government of British Columbia will do nothing to interfere with the mining prosperity of the province, which seems destined to reach record levels this year, if undisturbed. It notices, however, that a delegation recently called upon the Premier and Minister of Mines to discuss methods which might be adopted to improve conditions and that the "alien" ownership bugabo was once more injected into the situation.

British Columbia would do well to remember that development of its mining resources to the present satisfactory stage has been brought about almost wholly by aliens from this side of the line. Outside of the Canadian Consolidated Mining and Smelting company, practically every heavy corporation operating mines in the province has been financed by foreign capital. It would seem to us that just at this time particularly every inducement should be offered for employment of capital, domestic or foreign, in further expansion of latent resources.

It is of course, quite natural that loyal citizens of a country at war should wish to prevent use of its resources against itself. This can be accomplished, however, by surer and more modern means than by denying foreign capital entry into the country. For instance, provision of refining capacity and heavy export duties would prevent metals from leaving the country and would thus preserve them for the Empire's use, no matter what brand of capital had been used in producing them.

We were much interested in the announcement of the Minister of Mines that he is in favor of supplying one or two government smelters for use of mines at interior points. Theoretically, this would be an ideal solution of the producers' troubles, but we fear that in practice it would prove most expensive and entirely abortive.

Encouragement of foreign capital by every legitimate means would seem to us to be the logical course for British Columbia in the present serious state of the Empire's business affairs. Capital can always be controlled, at least in so far as its product is concerned, but the slightest inclination to adoption of narrow-minded policies will result in driving foreign capital so far away that it may never be coaxed back.

Premier Brewster and Minister of Mines Sloan would do well to think twice before they act along the lines indicated in press reports of the recent meeting. Further than that they might profitably confer with leading mining men of the province—men who are really developing its mining resources and, therefore, know something of the difficulties met with in securing adequate capital. Without casting reflections upon the prominent gentlemen who comprised the recent delegation, it appears quite patent that neither has had much actual experience in the development of mines, and is therefore apt to expound theories constructed in the comfortable vicinity of a swivel chair.

### SLOCAN STAR MINES, LTD., B.C.

The fifth annual meeting of the Slocan Star Mines Limited, was held in Vancouver, on December 27, Mr. R. S. Lennie, president of the company, occupying the chair.

The report of the directors stated the year had been an important one, in that adequate mine and mill equipment had been supplied, and although unavoidable delays occurred in its installation it had been completed and will permit of operation to full capacity the year round. Shortage of water and power at certain seasons of the year has detrimentally affected development and production, but those difficulties have been overcome and the plant had been paid for by sale of debentures, whereby an issue of \$100,000 was made by 7 per cent. bonds. A market was found for the zinc concentrate on hand at date of last report, giving a gross return of \$35,271.63, and lead concentrate had since been produced amounting to \$113,536.66, which resulted in a net smelter value of \$85,109.01 or \$89.41 per ton, while lead slime amounted to \$7,438.90, of a net smelter value of \$5,364.69, or \$73.32 per ton. Crude ore was shipped, amounting to \$10,059.55, giving a net smelter value of \$8,001.31, or \$119.57 per ton. Zinc concentrate shipped gave a net value of \$5,139.05, or \$9.01 per ton.

The unsatisfactory zinc return necessitated the improvement of the plant and the adoption of a process determined upon after numerous tests and investigations. Development consisted of 1,609.4 feet of drifts, raises and crosscuts in the different levels of the mine and the directors expressed themselves as confident that the recent developments, improved markets, metal prices and improved equipment for handling and saving products, should during the new year, result in much better returns and more profitable operations.

The balance-sheet showed profits for the year of \$16,619.18, which will mainly be applied towards the liquidation of the debenture issue.

The directors were re-elected, the board consisting of: Messrs R. S. Lennie of Vancouver, president; A. C. Burdick, Victoria, vice-president; T. S. McPherson, Victoria; J. Elliott, Vancouver; J. B. White and J. B. McGoldrick, Spokane; and J. M. Harris, Sandon.

### THE ONLY PEACE.

They come to us with dripping hands,  
Blood stains the "olive branch" they bear,  
Trampling across the ravished lands  
Where tortured peoples know despair,  
They prate of peace whose brutal grip  
Still holds the realms we swore to free;  
The cracking of the slaver's whip  
Still mocks the plaint of liberty.

Deep down beneath the ocean waves  
The pirates' murdered victims sleep;  
By many a thousand British grave  
In spirit still our watch we keep.  
And now the bully in his pride  
Would bid the hand of vengeance stay,  
Knowing the signs that well betide  
The dawning of our brighter day.

By all our dear and splendid dead,  
By all the blood and all the tears  
That British hearts and eyes have shed  
In our long agony of years,  
There is no ending to the fight  
Till, smitten by the final thrust,  
The powers of darkness and of night,  
Are spurned and trampled in the dust.

—Touchstone, in London Daily Mail.



**McINTYRE PORCUPINE MINES, LIMITED.**

The following letter to shareholders was issued Jan. 19, 1917, by President A. M. Hay:

I beg to advise you that at the special general meeting of shareholders held here on 28th December last, consolidation of the McIntyre group of properties on the basis set forth in my letter to shareholders, dated 4th December, 1916, was unanimously approved of, and the necessary steps have been taken by all the companies interested to carry the same into effect.

The nominal capital of this company has been increased by one million shares, of which 294,000 shares have been issued to the McIntyre-Extension Company, and 316,298 shares to the McIntyre-Jupiter Company, against transfer by these companies of all their property and assets, which are now vested in this company:

The following is a memorandum of production and operations for the quarter ended 31st December, 1916: McIntyre ore—Tons milled, 33,558; value per ton, \$10.62; gross value, \$356,504; recovery, \$340,194; operating cost, \$151,420; per ton, \$4.51; operating profit, \$188,773. Custom ore—Tons milled, 5,811; profit from milling custom ore and from subsidiary company operations, \$20,216. Total milled, 39,369 tons. Total profit, \$208,990.

Construction—The amount expended during the quarter on McIntyre and McIntyre-Extension properties for mine equipment, buildings and plant amounted to \$46,242. This expenditure was largely in connection with operations at the main shaft, including crusher house, ore bins, aerial tramway and terminals at main shaft and mill.

No. 4 Shaft—13,330 tons of ore of an average grade of \$7.20 per ton, equal to about 40 per cent. of the total tonnage of McIntyre ore milled, came from these workings. No important ore bodies were encountered in the workings south from this shaft.

No. 5 shaft—The raise from the 1,000 to the 700 foot level of this shaft was completed. Stations have been cut at 800 and 900 ft. Crosscuts are now being driven to reach the ore bodies already located on these horizons by diamond drilling, and to connect with ore passes to the main system of transportation on the 1,000 ft. level to the main shaft. Advances have been made east and west on the 600 ft. and 700 ft. levels on No. 5 vein and on vein No. 714. All the faces continue in high grade milling ore.

Main Shaft—Drifting east and west on the boundary vein on the 1,000 ft. level on McIntyre and McIntyre-Extension ground has been advanced for a total length of 670 ft, over 550 ft. being in high grade milling ore. Production of ore and development on this level has been curtailed pending completion of the new hoisting and transportation equipment. Stopping operations now going on show a width of from 8 to 40 ft. of ore averaging over \$15 per ton. Drift No. 1026 on the McIntyre-Extension ground on the 1,000 ft. is now within 233 ft. of the Jupiter boundary line, the present face is in ore assaying over \$10 per ton. Work on this drive to the east will be pushed in order to test the ground on Jupiter west lot at this level and ultimately to connect the main shaft with the Jupiter shaft and workings on the Jupiter east lot.

McIntyre-Jupiter Mine—During the quarter 5,469 tons of ore from this property were milled, at an average value of \$13.25 per ton, resulting in a gross profit of \$23,081.60. Under the terms of consolidation this and all profits previously earned by the McIntyre-Jupi-

ter Company become the property of the McIntyre-Porcupine Company.

Milling Operations—The installation of the new hoisting and crushing plant at the main shaft has been held up on account of delays in delivery of plant. The aerial tramway has, however, been completed and tonnage of ore to the mill has been increased since the first of the new year, and has now reached 500 tons per day.

Plenaureum Mine—As reported at the special general meeting of shareholders held on 28th ultimo, your directors have secured, under option, a controlling interest in the Plenaureum property, consisting of 120 acres, for a period of twelve months from 8th December, 1916. This property adjoins the Jupiter mines, recently absorbed by the McIntyre Co., and stands in the same relation to the large body of quartz porphyry underlying Pearl Lake as the Hollinger, McIntyre Extension and Jupiter properties. A considerable tonnage of high grade ore has already been developed on the property. Under the above conditions your directors feel that they would not have been acting in the best interests of the shareholders had they neglected the opportunity of securing an option on a property with such potentialities.

Dividend—At a meeting of the directors held here to-day, a dividend of five per centum was declared on the outstanding capital stock of the company, payable on the 15th day of February to shareholders of record at the close of business on the 5th day of February, 1917.

**HYDRAULIC RESOURCES.**

In estimating the value of Canada's hydraulic resources and their importance with reference to future industrial development, the extent to which electro-chemical processes have entered into some phases, at least, of nearly every branch of our industrial life is not generally appreciated.

A small beginning in our electro-plating, two generations ago, has developed until the great bulk of the copper output of the world is electrolytically refined. The electrolysis of common salt is the basis of the electrolytic alkali industry, the products of which are caustic soda, metallic sodium, chlorates, and hypochlorates. The electric furnace has created a host of new industries, producing chiefly abrasives, graphite, silicon, ferro-alloys, refined steel, phosphorus and calcium carbide. It has also been tested experimentally as a competitor of the combustion furnace in the metallurgy of many metals.

Used as an electrolytic furnace, we have the very important application to the production of aluminum. The industrial use of electric discharges through gases is still in its infancy, but we have ozone and nitric acid among the products, the former used for sterilization, and the latter as a basis for fertilizers and explosives.

Every one of these industries consumes large quantities of energy. Whereas the refining of lead requires only 120 k.w.h. per ton, we have consumptions as high as 4,000 k.w.h. per ton for other metals. The aluminum furnace requires 25,000 k.w.h. per ton of product.

The electro-chemical industries have grown to be of great value to countries which possess good opportunities in water power resources, as they have a fundamental interest in the development of cheap power. —L. G. D.



**FOGHORN MACDONALD.**

The following was published in the December bulletin of the Canadian Mining Institute:

Probably no man connected with the Canadian forces, not even Sir Sam himself, has become so widely known as our good friend 'Foghorn' Macdonald. He is also universally popular which does not always go with notoriety. Stories of him and of his prodigious vocal development are now appearing with frequency in the American newspapers, and during the past few weeks the present writer has accumulated nearly a drawerful of cuttings sent to him by members and others from practically every corner of the continent, recounting the exploits and escapades of the redoubtable Neil. The stories are intended to raise a smile and they do raise a smile. That is one of Foghorn's virtues that he is a great dissipator of gloom—a delightful optimist. But apart from their humour, if one analyzes these tales one finds something else, something very big and fine and at the same time typical of the free democratic spirit that animates the whole Canadian Armies. It is an indomitable spirit that cannot be crushed or daunted, and it is a chivalrous, humane spirit that does not hate, that cannot understand hate in the German sense, but nevertheless is implacable and untiring. Of Foghorn and the many good men like him we, his fellow members in Canada, are immensely and justifiably proud, and we like to read yarns about them such as this. "How are things going at the front," a journalist asked Foghorn, on leave in London. "Going!" said he "Why the boys are getting so gay out there one of our battalions came parading up to the front line trenches the other day with a brass band playing for all it was worth. They were right where you could get killed any minute, too, and even my old boss thought they were crazy. Guess I'll be getting back to the front soon myself," he concluded, with a sigh; "this quiet life of London is getting on my nerves." And this is a man well on the wrong side of fifty, who enlisted as a private. All his friends rejoice to know that his sterling worth has been recognized, that he has been again promoted and now holds the rank of major.

It is stated that the Tonopah Mining Co., a Philadelphia organization, which is developing a mining property at Schist Lake, via The Pas, Manitoba, is arranging to take out 5,000 tons of copper ore this winter, haul it to Sturgeon portage 38 miles, convey it thence by water to The Pas and then ship it by rail to Trail, B. C., for smelting at the Consolidated Co's smelting works.

On January 12 the Trail News stated that a section of the Consolidated Mining and Smelting Co's electrolytic lead refinery at Trail, B. C., was then being used for copper refining. Erection of the structural steel for the addition being made to the company's electrolytic copper refinery, to increase the daily capacity to 17 tons, had then been just completed.

Night classes for instruction in mining and associated subjects have been opened at Nelson, B. C., and are being attended by prospectors, high-school students, and others. Mr. W. E. Cook, of the Nelson high-school staff is instructor, and his list of subjects includes mineralogy, mine geology, blowpipe analysis, explosives and their use, principles of mining, metallurgy of the common metals, and ore-dressing.

**DEATH OF COL. A. M. HAY.**

Toronto, Jan. 22.—Col. A. M. Hay, president of the McIntyre Porcupine Mines, and director of many others, died at 6 o'clock Saturday, Jan. 20. He had been ill only a short time.

Col. Hay was born in Scotland, October 25, 1859, and upon maturity became interested in the shipping business in which his father was engaged. He came to America in 1890.

Col. Hay's first American enterprise was to organize an English company—the Isle Royale Land Corporation—to purchase the island of that name in Lake Superior. The Wendigo Copper Company was formed as an auxiliary for mining purposes on the island. He was managing director of these companies till 1896 when he purchased the Mikado mine in Ontario and resold it to an English company.

He afterwards organized the Dominion Gold Mining and Reduction Company another English corporation, with works at Rat Portage, Ontario, of which he was managing director, and made his headquarters there for about ten years, during which time he was engaged in various mining enterprises in Mexico, the United States and Canada. He entered the Cobalt district in 1906, and has been identified with the mining and development of Northern Ontario ever since. He was president of the Trethewey Silver Cobalt Mine, Limited; the Northern Exploration Co., Limited, and the McIntyre-Porcupine Mines, Limited, and a director of various other mining and industrial corporations.

Col. Hay became president of the McIntyre Mines in May, 1915, when the old company was reorganized with a new directorate. Under the able guidance of the new directors with Col. Hay as their head great strides were made until to-day the McIntyre Consolidated Company is one of the biggest producers in the north country and is a worthy rival of the famous Hollinger and the Dome.

Until two weeks ago Col. Hay was in Toronto at the office directing the affairs of the company. He went north to his home in Haileybury on account of a slight indisposition. In order to get some information with regard to the quarterly report, which was to be issued he went up to the mine and there contracted pneumonia.

Col. Hay was widely known in the business world and was universally liked. In politics he was a Conservative, and in religion a Presbyterian. His home was in Haileybury. He had no children.

**TO ENCOURAGE HOME REFINING.**

Ottawa, Jan. 8.—It is foreshadowed that legislation will be introduced this session looking to the development of the refining of lead, copper, and zinc, so that the Empire may not have to depend on foreign sources of supplies in war time for these metals, indispensable in munitions manufacture. For several months officers of the finance department have been inquiring into the metallurgical industries with this end in view.

**LAKE SHORE MINE.**

New surface plant at the Lake Shore mine, Kirkland Lake, is now in operation. It is expected that work will soon be started on a mill.



## PERSONAL AND GENERAL

Mr. A. A. Cole has been nominated for re-election as president of the Canadian Mining Institute.

Mr. R. H. Coates, Controller of the Census, addressed the Toronto branch of the Canadian Mining Institute on Saturday Jan. 20.

Mr. J. S. McLeish of the Mines Branch, Ottawa, addressed a meeting of the Royal Canadian Institute in Toronto on Saturday, Jan. 27.

Hon. T. W. Crothers, Minister of Labor, has left Ottawa for Fernie to endeavor to settle the coal miners' strike. He is accompanied by Mr. R. F. Green, M. P. for Kootenay.

Mr. Robert Bryce wishes to state that he has resigned as consulting engineer of the Cheney Copper Co. Ltd.

Mr. W. J. Barker, of Nelson, for several years in charge of the Arlington gold mine, in Erie camp, Nelson mining division, British Columbia, who last year went to Montana, recently returned to Nelson and is now at the Yankee Girl mine, near Ymir, south of Nelson.

Mr. John F. Miller, of Trail, B. C., superintendent of the Consolidated Mining and Smelting Co's electrolytic refineries, has resigned, after about eighteen years continuous services at the Trail works.

Mr. E. Jacobs, of Victoria, B. C., secretary of the Western Branch of the Canadian Mining Institute, was one of several invited speakers at the "Open House" and smoker arranged by the College of Mines of the University of Washington, Seattle, Washington, in connection with the recent opening on the University campus by the United States Bureau of Mines of a mining and metallurgical experiment station. The staff of the station thus far appointed consists of Dr. Dorsey A. Lyon, superintendent; Mr. U. B. White, chief clerk, and Mr. Geo. Watkin Evans, coal mining engineer. An electro-metallurgical engineer is yet to be appointed. The work of this station will be restricted chiefly to experimental and economic problems with a view to the elimination of waste and utilization of by-products from minerals. The work of the Bureau's mine rescue station, established at the university six years ago, will be continued, this including training of university students and miners in mine-rescue and first-aid work, with Mr. J. J. Corey in charge.

Two well known officials of the Consolidated Mining and Smelting Co. have recently been bereaved. About the end of December Mr. M. E. Purcell, of Rossland B. C., superintendent of the company's Centre Star-War Eagle group of mines, lost his mother who died at Rossland at an advanced age. On January 14, the wife of Mr. S. G. Blaylock, the company's assistant general manager, died quite unexpectedly at Trail. Both mourners have the earnest sympathy of a wide circle of friends among the mining community of British Columbia.

Mr. Bruce White, of Sandon, Slocan, manager of the Noonday Mines Co., who went to Skowhegan, Maine, to spend Christmas and New Year with his family there, expects to return to British Columbia about the middle of February.

Mr. Chas. Graham, for several years superintendent for the Corbin Coal and Coke Co., with coal mines at Corbin, Crowsnest district of British Columbia, has resigned to accept the position of superintendent of

the Crow's Nest Pass Coal Co's Michel colliery, also in Southeast Kootenay.

Mr. John Hopp, the well-known hydraulic placer-gold mining operator, for years actively engaged in mining in Cariboo district of British Columbia, was called to Spokane, Washington, the first week in the New Year to attend the funeral of a married sister who had died in that city.

Mr. R. C. Hargrave, of the Consolidated Mining and Smelting Co's laboratory staff, left Trail, B. C., recently to accept a commission in the Royal Engineers for war service in Europe.

Mr. W. A. Wylie, mine superintendent for the Britannia Mining and Smelting Co., operating the big copper mine near Howe sound, in Vancouver mining division of British Columbia, has gone to San Francisco, to spend a holiday there after four years of strenuous work. It is stated that the company has not accepted his resignation, but he may not return to the Britannia mine. The "Daily Province" quotes Mr. Wylie as having said, when in Vancouver on his way to California: "The Britannia is such a busy place that the only way one can get a holiday is simply to quit. There has been a shortage of power for some time, owing to the lack of water in the creeks supplying the generating plant, but the recent heavy rains should correct that. There has been a great improvement throughout the property and plant during the last year, a very large amount of work having been done both at the upper and the halfway sections of the mine plant. Development work is also being carried on at some of the more distant parts of the property, which in due course will also be brought into production. With the price of copper as high as it is, continued activity may be expected. Mr. Wylie was the recipient of several gifts from the mine employees before he left, these including a handsome gold watch with nugget chain and locket, and a solid silver cigar case and match case.

Mr. Sidney J. Jennings and Mr. Philip V. Moore are candidates for the presidency of the American Institute of Mining Engineers.

Mr. E. P. Mathewson, Toronto, general manager of the British America Nickel Corporation, has been awarded the coveted gold medal of the Metallurgical Society of America for his achievements in metallurgy during the past year. The medal is awarded annually to the member performing the most valuable service in the interest of the development of American mineral resources.

Mr. Hamlin Brooks Hatch, formerly of the Engineering staff of the Dome Mines, has been appointed engineer in charge of mining operations on the Tommy Burns Porcupine properties.

Mr. H. Darling, formerly Engineer at the Porcupine Crown, is now manager at the Dome Lake.

Mr. C. H. Manaton, Toronto, has been elected an associate member of the Canadian Mining Institute.

Mr. S. F. Kirkpatrick, Professor of Metallurgy, Queens University, has been appointed a member of the Honorary Advisory Council on Industrial and Scientific Research.

Mr. J. B. Tyrrell has left Toronto to visit one of the mining properties in the Rice Lake gold district in eastern Manitoba.



## SPECIAL CORRESPONDENCE

### COBALT AND PORCUPINE

#### Vipond-North Thompson.

The ore being treated at the Vipond mill in Porcupine since the merger of the Vipond and North Thompson is practically all coming from the North Thompson property and the mill heads are expected to be considerably higher than for some time past. A crosscut is being driven at the 600 ft. level to connect the two properties.

#### Porcupine Milling Capacity.

Milling capacity of the Porcupine mines during 1916 has increased approximately 1,065 tons per day, and at the commencement of 1917 the daily milling capacity of the camp is estimated at 4,263 tons. The anticipated increase during the year 1917 will greatly surpass this figure, and it looks as if the gold mining industry in the north country was at last coming into its own.

#### New Gold Discoveries.

New discoveries of gold in the townships of Cairo, Powell and Kimberley have caused quite an influx of prospectors to the district, which is located some twenty-two miles from Elk Lake, near Fort Matachewan, on the Montreal river. The specimens brought to Haileybury are not spectacular, but the gold seems to be distributed very evenly through the quartz and the values are said to run very high.

#### Lake Shore.

During the past year the Lake Shore Mining Co. at Kirkland Lake have done some aggressive development work, with the result that they now have a shaft sunk to the 300 ft. level and have accomplished 600 ft. of drifting, 160 ft. of crosscutting and 16 ft. of raising at this level. At the 100 ft. level over 100 ft. of drifting has been done. A large percentage of the workings are said to be in excellent ore and it is estimated that already over \$300,000 worth of ore is blocked out. A ball mill with a capacity of from 60 to 100 tons daily has been ordered for the Lake Shore, and the work of installation will shortly begin.

#### Murray-Mogridge.

At Bourke's Siding on the T. & N. O. Railway, a new company, known as the Murray-Mogridge, has started to develop a 400 acre property, which is located three miles from the main line of the railway, near Wolfe Lake. To date development work has been confined almost entirely to sinking on one vein, which has been traced for a distance of 2,000 feet. A shaft 50 ft. in depth has been sunk at each end of this vein, with very gratifying results. A force of men has been engaged on the property for the past three months, and will be considerably augmented in the near future as the company have outlined an extensive plan for the development of the property.

#### In Deloro.

Porcupine Premier, Maidens-McDonald and the Anchorite, the latter two under option to the La Rose and Coniagas of Cobalt, respectively, are located in Deloro township, and all are meeting with excellent results at depth. The Porcupine Premier is sinking to the 300 ft. level to prove the ore bodies existing at the 100 ft. level.

#### Hunton-Kirkland.

The Hunton-Kirkland Co. has ordered an electric compressor, hoists and other equipment which it is ex-

pected will be installed some time in February. This Kirkland Lake property, which has passed into the control of New York interests, will now be given a chance to prove its merits. Work on the erection of camp and plant buildings is to be commenced at once.

#### National.

Test runs of the oil flotation process were made last week at the plant recently installed at the National mines, Cobalt, where the company purpose treating the tailings impounded from the King Edward mine, which is now known as the National mines. These tailings are said to contain about seven oz. of silver to the ton, and it is estimated that there are forty thousand tons available for treatment.

#### Boston Creek.

The Crown Reserve Mining Co. of Cobalt has again entered the Boston Creek district and have optioned the O'Donald group of claims lying between the R. A. P. Syndicate and the Boston Hollinger. The option price is said to be a large one. A staff of men have already commenced surface work and the erection of camp buildings is proceeding. The company have outlined an extensive plan of development. The main veins of the Boston-Hollinger, the R. A. P. Syndicate and Boston Creek mines are said to cross these claims.

#### Hayden.

The Hayden, which lies about three miles south of Timmins, is now being developed at the 300 ft. level. Orebodies which consist of three veins each with an average width of nine feet, have been found to continue to depth with remarkable consistency.

#### Pittsburg-Lorrain.

About thirty men are now employed at the Pittsburg-Lorrain property in South Lorrain. Some high grade ore has been encountered at the 300 ft. level.

#### Hargraves.

At the 375 ft. level of the Hargraves some rich ore has been encountered. The vein at this point is from six to eight inches in width, and carries an average silver content of around 2,000 oz. to the ton. A winze is being sunk on this ore shoot, and the bagging of high grade ore commenced. Three machines will be kept running.

#### Schumacher.

The crosscut at the 200 ft. level of the No. 4 shaft of the Schumacher, which was sunk between two vein outcroppings, has cut the south vein at a point 60 ft. south of the shaft. Up to the present the vein has been cut to a depth of 17 ft. with the face of the crosscut still in ore.

#### Dome Lake.

Delay in the receipt of parts has delayed the opening of the Dome Lake mill. However, the cyanide end is now being tried out, and in a very short time everything should be going at full capacity.

#### McIntyre.

The McIntyre-Porcupine is now producing over \$5,000 per day. The average grade of ore is nearly \$11 to the ton, and when the mill is brought to its full capacity of 600 tons daily the costs will probably be reduced to \$4 per ton, leaving a profit of \$7 a ton on every ton milled. The company's earnings should then amount to \$4,200 per day, or a profit of \$1,533,000 on the \$3,610,288 issued capitalization.



## BRITISH COLUMBIA

The year has opened with much confidence felt relative to the progress that will be made in mining in 1917. The delay that has taken place in settlement of the differences between the coal mine employees and operators in the Crownsnest district of British Columbia and the neighboring coal mining territory in Alberta is not reassuring, but it is still hoped there will be an amicable understanding arrived at, so that there will not be any further restriction of the supply of coke for the blast furnaces of the smelting works in West Kootenay and Boundary districts. Shipment of ore from the Consolidated Co.'s mines in Rossland camp has been resumed after a suspension of production of only two weeks. On the other hand, for some unannounced reason, no ore at all was received at Trail from Slocan mines during the first week in January, but this may have been due to transportation difficulties, although this is only a surmise. It is to be expected that for several weeks winter conditions will interfere somewhat with the movement of ore from mines in districts where the snowfall is heavy and the trails and roads consequently at times unsuitable for heavy hauling to be done over them.

### EAST KOOTENAY.

The concentrating plant at the St. Eugene mines, Moyie, Fort Steele mining division, is again in operation, work having been resumed early in January. Some additions were made to the machinery late in 1916. The works had been idle for about five years. Mr. A. G. Monkhouse, formerly in charge of Consolidated Mining and Smelting Co.'s Highland concentrator, near Ainsworth, Kootenay lake, West Kootenay district, is superintendent at the St. Eugene. Part of the mine is being worked by a leasing syndicate of miners.

The Lead Queen, in Windermere division, resumed shipping ore to Trail late in the year, though not in large quantity, the long wagon haul to the railway at Brisco preventing shipment of any considerable tonnage. The Paradise, in the same division, continues to ship receipts at Trail from this mine during the first week in January having been 86 tons. There is talk of putting a concentrating plant on the Victor, in Fort Steele division, but as there seem to have been given publicity recently, some much inflated statements concerning quantity of ore on this property, reports as to what will be done in the near future may well be received with caution.

### WEST KOOTENAY.

**Ainsworth.**—The Bluebell and Comfort lead mines, on the east side of Kootenay lake, and the Highland, on the west side, continue to be the chief shippers of ore from this division, though the Bluebell was not on the list for the first week in 1917. The Silver Hill, near Crawford bay, also on the east side of the lake, sent a small lot of ore to Trail lately, this being the first ore sent from this property in recent years. The concentrating mill of the Florence Mining Co. is not yet completed, but it is expected that construction and equipment will soon be finished and a start be made to concentrate ore, of which there has been much opened underground in the company's mine within a mile of the lake. Provision has been made for generating power on one of the branches of Woodbury creek, an aerial tramway has been constructed between mine and concentrating mill, and generally progress has been made toward production on a fairly large scale, as

compared with other mines in Ainsworth camp. From Kaslo has come the news that the mill is expected to be in operation before the close of January.

**Slocan.**—The Kaslo "Kootenaiian" has published the following relative to the Van-Roi Mining Co.'s property, situated in the neighborhood of Four-mile creek, and distant about five miles from Silverton on Slocan lake: "A deal of considerable importance has been closed by which Mr. Clarence Cunningham of Sandon, has taken a lease and bond on the Van-Roi group, near Silverton, which previous to the War was worked by a subsidiary company of the Le Roi No. 2, Ltd., of Rossland, operating under the name of the Van-Roi Mining Co. Mr. Cunningham was in New York at the time the deal was closed, and it is possible he may have interested Eastern capital in the project. At any rate it is learned from an outside source that one of the terms of the lease is that the sum of \$50,000 must be spent in development work.

"The work at the Van-Roi is to be in charge of Mr. F. Cushing Moore, late of Wallace, Idaho, who is a mining engineer of long experience, and from whom big things are expected in rehabilitating the mine. He left Sandon on January 6 for the mine to get things moving underground. Some outside work has already been accomplished. It is intended first of all to extend drifts Nos. 7 and 9.

"Previous to the outbreak of the War, at which time the mine was closed, the Van-Roi produced a considerable quantity of ore, and at one time there were as many as 80 men on its payroll. By the time, however, that war was declared, the development of the Van-Roi has fallen behind, so that when the prices of metals fell it was not possible to continue operations. The property is unusually well equipped, having a 100 ton concentrating mill, good water-power, compressor, buildings, etc.

"Mr. Cunningham, who is operating the Wonderful, the Slocan Sovereign and the Queen Bess, appears to be very lucky in all of his undertakings in the Sandon part of Slocan district, he having turned three 'dead ones' into ore shippers in a short time. If his good fortune continue in respect to the Van Roi, he may succeed in adding fresh laurels to the splendid mineral production record of mines near Silverton."

It may be added that Mr. Cunningham also a short time ago bonded the Idaho-Alamo group of mines, situated at the head of Howson creek, which flows into Carpenter creek a mile or two below Three Forks. It is probable his so-called "luck" is rather the result of intelligent and persistent work in operating mines.

### COAST DISTRICT.

A quantity of copper ore, stated to be about 400 tons, but probably a smaller quantity, was a few weeks ago shipped from the Indian Chief mine, on Sidney inlet, west coast of Vancouver island, to the smelting works at Tacoma, Puget sound, Washington. The average copper content of this ore is given as having been rather less than five per cent. The mine has been worked, with somewhat long intervals of inactivity, by several different syndicates or companies, but heretofore without long-continued profitable results.

Messrs. Jones & Rant, a Victoria firm of contractors, have entered into an agreement with the Valdes Copper Co. of Victoria, to do development work on that company's group of claims on Quadra and Steep islands of the Valdes group of islands lying between the Mainland of British Columbia and Vancouver island, on the east side of Discovery passage, which is the route of



most of the steamers trading on the coast. The company owns ten claims, known as the Copper Mountain group, situated on Quadra island, and one claim, the Bluebird, on Steep island. In a report by Mr. J. W. Astley, M.E., printed in the 1914 Annual Report of the Minister of Mines for British Columbia, these properties are described in some detail, and the following general information is also given:

"The formation in which the ore is found is a series of flat-lying ashbeds or flows, with a slight dip generally to the south or southeast. These beds or layers vary in texture from a porous amygdaloidal structure to a fine-grained compact rock. It is in this formation that the ore occurs along zones of shearing or faulting.

"The development has been mostly carried on in the crushed or brecciated areas on either side of these zones of weakness. It is chiefly in the more porous beds or layers, when outcropping on the surface, that the development work has been done. This superficial development discloses large irregular areas of copper-stained and copper-bearing rock.

"The mineralization, mostly as chalcocite, is disseminated in small particles through the rock, varying in quantity according to the porous nature, or otherwise, of the different beds or layers, and in a more concentrated form as replacement filling of amygdaloidal cavities of the more porous beds.

"The copper occurs chiefly as chalcocite, but azurite, malachite and the red and black oxides of copper are also present, and this is more noticeable at or near the surface. Chalcopyrite only occurs in very small quantity.

"All the development work done is superficial. Shallow cuts and openings have disclosed large irregular areas of copper-stained and copper-bearing rock and ore on the surface, but very little depth has been attained. The deepest cut is only 16 ft., and most of the openings have only penetrated the surface two or three feet. For this reason nothing can be said with any degree of certainty as to how the mineralization will hold out at depth. Whether it will be more or less continuous in the vicinity of the crushed zones, or if it will be confined to certain beds or layers, remains to be proved, by deeper development. Many of the showings warrant a system of vigorous development."

It may be added that since Mr. Astley reported on the property it has been examined for United States capitalists by Mr. J. L. Bruce of Butte, Montana, and two or three other well known engineers from the United States, but although the showings were considered to be very promising, there was altogether too little development work done to induce the taking of it over by men who were looking for developed mines, not for prospects.

#### GENERAL NOTES.

A carload of silver-lead ore from the Ethel mine, in Trout Lake mining division of West Kootenay, was shipped early in January by steamer from Trout Lake city to Gerrard, and thence by railway and steamer to Trail.

A correspondent of the Nelson "Daily News" states that Andy Daney of Trout Lake city and six associates of Camborne and Beaton, have leased the Beatrice silver-lead mine, H. Y. Anderson and Dr. W. H. Willson having discontinued working it. The mine is situated in Lardeau mining division, in the mountains above Camborne, and some years ago a considerable quantity of ore was shipped from it. The lessees intend to do work on the property throughout the winter.

Ore receipts at the Consolidated Mining and Smelting Co.'s smelting works at Trail during the first week of 1917 were comparatively small, the total having been only 5,695 tons. The several districts and mining divisions from which the ore came were as follows: East Kootenay, 1,840 tons; West Kootenay, Ainsworth, 230 tons; Nelson, 116 tons; Trail Creek (Rossland), 1,883 tons; Boundary, 116 tons; Yale; Nicola, 83 tons; Kamloops, 86 tons; Omineca division, 34 tons; United States, 783 tons. Of the total, 4,234 tons was from mines operated by the Consolidated Co., and 1,461 tons was of custom ore. The shipments from the company's mine were: Centre Star and Le Roi, Rossland, 1,704 tons; Sullivan, East Kootenay, 1,684 tons, and St. Eugene 36 tons; Highland, Ainsworth, 170 tons; Emma, Boundary, 640 tons.

#### MacKINNON, HOLMES & CO.

Changes in the management of MacKinnon, Holmes & Co., Limited, of Sherbrooke, Que., have recently taken place, caused by the retirement from the company of Mr. A. R. Holmes, who in the past has occupied the position of director and secretary-treasurer.

It is understood that Mr. J. W. Bowman, president, and Mr. G. D. MacKinnon, vice-president and general manager, have purchased the holdings of Mr. A. R. Holmes and his friends, and new directors, in the person of Dr. A. W. Klein of Greenwich, Conn., M. L. MacKinnon and J. Nicol of Sherbrooke, Que., have been elected with Mr. F. C. Johnston, secretary-treasurer.

The business will be conducted as in the past, under the management of Mr. G. D. MacKinnon, and it is understood the company is making extensive plans for future development.

This company has been particularly successful in its general business of structural steel and steel plate work, having one of the most complete plants in the country for these special lines. It has also been successful in the forging of shells for the Imperial Munitions Board, having a very complete and up-to-date plant for this special work.

#### NOVA SCOTIA STEEL.

Boston, Jan. 23.—About the only large sized fly in the Nova Scotia Steel ointment is the question of the size of the British war tax. Based upon the assumption that 25 per cent. will satisfy this tax in 1916, it seems practically assured that during its fiscal year to December 31 last, Nova Scotia Steel earned better than \$40 per share on its \$7,500,000 common stock. This is after all interest and prior obligation charges. It is a smaller balance than seemed likely four or five months ago, but it compares most favorably with the 20 per cent. earned in 1915.

So far as 1917 operations are concerned the company would seem to be about as well guaranteed as a manufacturing corporation can well be.

Its entire productive capacity for 1917 is sold ahead. If more orders are taken it will be on the hypothesis that mill additions nearing completion or in middle process of completion will be productive in time to make the taking of these orders feasible.

It has been rumored that Nova Scotia Steel directors might do something at an early date in the direction of common dividends. While the matter is not definitely settled, nothing was done at the directors' meeting early this month and there are strong interests in



the property who feel that the present is not the time to undertake common dividends.

Orders at more than 100 per cent. capacity and inventories 100 per cent. greater than normal mean large working capital and this can be better obtained by utilizing surplus earnings than by borrowing from the banks.

Nova Scotia Steel will have one new 2,700 ton steamship in commission in April and a second of the same size should follow shortly after that.

### PHYSICAL PROPERTIES OF MOLYBDENUM.

Pure molybdenum is a white metal. Its appearance depends largely on the method of production. If obtained by reducing the oxides or the sulphides of molybdenum by hydrogen, it is a gray powder which under heat and pressure may be compacted into a metallic bar that is brittle and even fragile. Produced by aluminothermic methods or by reduction in the electric furnace, it is a compact metal, but owing to the absorption of carbon in the electric furnace, it is not pure and has different physical properties from the carbon-free metal, as is explained later. Pure compact molybdenum is malleable and is sufficiently soft to be filed and polished with ease. It will not scratch glass.

Molybdenum produced by the reduction of molybdic oxide with carbon in an electric furnace does not possess the same physical properties as pure molybdenum, owing to its absorption of carbon. Metal obtained by this method is gray and brittle. It is also very hard and scratches steel and quartz; even the hardest file will not cut it when it contains a certain proportion of carbon. The melting point of the gray metal is much below that of pure molybdenum, and its specific gravity is also lower, ranging from 8.6 to 8.9, depending on the amount of carbon present. When pure molybdenum is surrounded with carbon and heated to about 1,500 degrees C., it absorbs carbon and becomes hard. Inversely, if carbon-bearing molybdenum is melted with molybdenum dioxide, the carbon in the metal is oxidized and the molybdenum is refined and takes on the physical properties of the pure metal.

### MOLYBDENITE.

Molybdenite is the disulphide of molybdenum ( $\text{MoS}_2$ ) and contains 59.95 per cent. of molybdenum and 40.05 per cent. of sulphur. It is a soft, opaque, lead-gray mineral with a metallic luster and greasy feel. It commonly occurs in flakes or scales having a prominent basal cleavage, and resembling some micas in the way the flakes may be split into thin leaves. Finely granular and massive forms are also common. The mineral is sectile and in the flaky form the laminae are flexible but not elastic. In hardness it ranges from 1 to 1.5, being so soft that it soils the fingers readily in handling and marks paper, on which it leaves a bluish-gray trace. On porcelain its streak is slightly greenish. Its specific gravity has been variously determined at 4.7 to 4.8 degrees.

On account of many similar characteristics molybdenite is often confused with graphite, but it may be easily distinguished from the latter as graphite has a much lower specific gravity, 2.09 to 2.23, and its streak is lead-gray on both paper and porcelain. Heating a fragment of the mineral in a closed tube will conclusively settle any further question as to its identity, as

the strong sulphurous odor given off by molybdenite is entirely lacking with graphite.

The award of the gold medal of the Metallurgical Society of America to Mr. E. P. Mathewson is an acknowledgment of the work he has done in metallurgy in the United States. Mr. Mathewson has gained an enviable international reputation and it affords pleasure to his friends to see his services thus recognized. Anaconda and Mathewson have been synonymous with success in the copper world. We can only wish for Mr. Mathewson and the company he is now connected with that his name will become linked in the same way with British-American nickel.

### TORONTO MARKETS.

|                                                            |
|------------------------------------------------------------|
| Cobalt oxide, black, \$1.05 per lb.                        |
| Cobalt oxide, grey, \$1.15 per lb.                         |
| Cobalt metal, \$1.25 to \$1.50 per lb.                     |
| Cobalt anodes, \$1.50 to \$1.75 per lb.                    |
| Nickel metal, 45 to 50 cents per lb.                       |
| White arsenic, 5½ to 6 cents per lb.                       |
| Jan. 24, 1917—(Quotations from Canada Metal Co., Toronto)— |
| Spelter, 13½ cents per lb.                                 |
| Lead, 9½ cents per lb.                                     |
| Tin, 48 cents per lb.                                      |
| Antimony, 18 cents per lb.                                 |
| Copper, casting, 35½ cents per lb.                         |
| Electrolytic, 36 cents per lb.                             |
| Ingot brass, yellow, 22 cents; red, 24 cents per lb.       |
| Jan. 24—(Quotations from Elias Rogers Co., Toronto)—       |
| Coal, anthracite, \$9.50 per ton.                          |
| Coal, bituminous, nominal, \$10 to \$14 per ton.           |

### SILVER PRICES.

|         |         | New York,<br>cents. | London,<br>pence. |
|---------|---------|---------------------|-------------------|
| January | 6.....  | 75¾                 | 36½               |
| "       | 8.....  | 75¼                 | 36¾               |
| "       | 9.....  | 75                  | 36¼               |
| "       | 10..... | 75                  | 36¼               |
| "       | 11..... | 74¾                 | 36¾               |
| "       | 12..... | 74¾                 | 36                |
| "       | 13..... | 74¾                 | 36                |
| "       | 15..... | 74¾                 | 36                |
| "       | 16..... | 74¼                 | 36                |
| "       | 17..... | 75                  | 36¾               |
| "       | 18..... | 75¾                 | 36¾               |
| "       | 19..... | 75¾                 | 36¾               |

### MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

|                                                                      |
|----------------------------------------------------------------------|
| Ores carrying between 2% and 3% $\text{MoS}_2$ , \$14.00 per unit.   |
| Ores carrying between 3% and 5% $\text{MoS}_2$ , \$16.00 per unit.   |
| Ores carrying between 5% and 10% $\text{MoS}_2$ , \$17.50 per unit.  |
| Ores carrying between 10% and 15% $\text{MoS}_2$ , \$18.50 per unit. |
| Ores carrying between 15% and 20% $\text{MoS}_2$ , \$19.50 per unit. |

80% concentrates, \$1.09 per lb. of  $\text{MoS}_2$ .

Penalties imposed for copper and bismuth.

No settlement made for any molybdic oxide in ores.

Settlement ten days after sampling.

Samples of ores to be submitted before any shipment made.

## MARKETS

## NEW YORK MARKETS.

## Connellsville Coke—

Furnace, spot, \$10.00.

Furnace, contract, \$6.00 to \$8.50.

Foundry, prompt, \$10.00 to \$11.00.

Foundry, contract, \$8.00 to \$8.50.

Straits Tin, f.o.b. nominal, 45.50 cents.

## Copper—

Prime Lake, nominal, 29.50 to 30.50 cents.

Electrolytic, nominal, 30.50 to 31.50 cents.

Casting, nominal, 28.25 to 28.75 cents.

Lead, Trust price, 7.50 cents.

Lead, outside, nominal, 7.75 cents.

Spelter, prompt western shipment, 9.92½ to 10.00 cents.

Antimony—Chinese and Japanese, nominal, 15 cents.

## Aluminum—nominal—

No. 1 Virgin, 98-99 per cent., 56.00 to 60.00 cents.

Pure, 98-99 per cent. remelt, 50.00 to 54.00 cents.

No. 12 alloy remelt, 36.00 to 40.00 cents.

Powdered aluminum, 85.00 to 90.00 cents.

Metallic magnesium—99 per cent. plus, \$3.00 to \$3.50.

Nickel—shot and ingot, 45.00 cents.

Electrolytic, 50.00 cents.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$80.00.

## Platinum—

Pure, \$90.00.

10 per cent., \$95.00 to \$96.00.

Cobalt (metallic), \$1.50.

Tungsten ore per unit, \$17.00 to \$17.50.

Silver (official), 75⅞ cents.

Metal Products—Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

## Sheet Copper—

Hot rolled, 42.00 cents.

Cold rolled, 43.00 cents.

Copper bottoms, 50.00 cents.

Copper in rods (round), 41.00 cents.

Square and rectangular, 42.00 cents.

Copper wire, nominal, 38.00 to 39.00 cents.

Copper wire, April-May, 33.50 cents.

## High brass—

Sheets, 39.00 to 40.00 cents.

Wire and light rods, 40.00 cents.

Heavy rods, 38.00 to 39.00 cents.

Low Brass—sheet wire and rods, 42.00 cents.

## Tubing—

Brazed bronze, 51.00 to 52.00 cents.

Brazed brass, 48.00 to 49.00 cents.

Seamless copper, 45.00 to 46.00 cents.

Seamless brass, 43.00 to 45.00 cents.

Seamless bronze, 52.00 cents.

Full lead sheets, 9.25 cents.

Cut lead sheets, 9.50 cents.

Sheet zinc, f.o.b. smelter, 21.00 cents.

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell &amp; Co., Toronto.)

As of close January 24th, 1917.

## New York Curb.

|                             | Bid.  | Asked. |
|-----------------------------|-------|--------|
| Aetna Explosives .....      | 3.37  | 3.65   |
| Boston & Montana .....      | 75.00 | 77.00  |
| Butte Copper and Zinc ..... | 10.75 | 11.00  |

|                               |      |      |
|-------------------------------|------|------|
| Howe Sound .....              | 7.25 | 7.75 |
| Standard Silver and Lead..... | .56  | .68  |
| Allis-Chalmers. . . . .       | .28  | .28½ |
| Anaconda. . . . .             | .84  | .84½ |
| Granby .....                  | .89¾ | .90  |
| International Nickel .....    | .42¾ | .42½ |
| Westinghouse. . . . .         | .53¼ | .53½ |

## Porcupine Stocks.

|                          | Bid.  | Asked. |
|--------------------------|-------|--------|
| Apex. . . . .            | .10¾  | .11½   |
| Davidson .....           | .68   | .70    |
| Dome Consolidated .....  | .08   | ...    |
| Dome Extension .....     | .27¼  | .27½   |
| Dome Lake .....          | .50   | .51    |
| Dome Mines .....         | 21.50 | ...    |
| Foley O'Brien .....      | .70   | ...    |
| Gold Reef .....          | .03¾  | .04    |
| Hollinger Cons. ....     | 6.75  | 6.80   |
| Inspiration. . . . .     | .18   | .18½   |
| Jupiter. . . . .         | .32   | .33    |
| McIntyre. . . . .        | 1.96  | 1.97   |
| McIntyre Extension ..... | .59   | .60    |
| Moneta. . . . .          | .15¼  | .15½   |
| Newray. . . . .          | 1.40  | 1.41   |
| Porcupine Crown .....    | .72½  | .75    |
| Porcupine Gold .....     | .01½  | .01¾   |
| Porcupine Imperial ..... | .04⅞  | .05    |
| Porcupine Tisdale .....  | .04   | .04½   |
| Porcupine Bonanza .....  | ...   | .10    |
| Vipond. . . . .          | ...   | .45    |
| Preston East Dome .....  | .06¾  | .06½   |
| Schumacher. . . . .      | .65   | .69    |
| Teck Hughes .....        | .75   | ...    |
| West Dome .....          | .30¼  | .30½   |
| Boston Creek .....       | 1.33  | 1.34   |
| Kirkland Lake .....      | .45   | .48    |
| Ken. Silver .....        | .24½  | .29    |
| Vacuum Gas and Oil.....  | .30   | .40    |

## Cobalt Stocks.

|                               | Bid. | Asked. |
|-------------------------------|------|--------|
| Adanac. . . . .               | .15  | .25    |
| Bailey. . . . .               | .05  | .06½   |
| Beaver Consolidated .....     | .36½ | .38    |
| Buffalo. . . . .              | 1.50 | 1.75   |
| Chambers Ferland .....        | .15  | .15¼   |
| Coniagas. . . . .             | ...  | 4.55   |
| Crown Reserve .....           | ...  | .43    |
| Foster. . . . .               | .03¾ | ...    |
| Gifford. . . . .              | .04½ | .04¾   |
| Gould. . . . .                | .00¼ | .00¾   |
| Great Northern .....          | .13¼ | .13½   |
| Hargraves. . . . .            | .15½ | .15¾   |
| Hudson Bay .....              | ...  | .70    |
| Kerr Lake .....               | 4.55 | 4.75   |
| La Rose .....                 | .53  | ...    |
| Lorrain Con. ....             | .40  | .41    |
| McKinley Darragh Savage ..... | .50  | .52    |
| Nipissing. . . . .            | 8.20 | 8.40   |
| Ophir. . . . .                | .09½ | .09¾   |
| Peterson Lake .....           | .11¾ | .12    |
| Right of Way .....            | .05¼ | .05½   |
| Seneca Superior .....         | .02½ | .02¾   |
| Silver Leaf .....             | .02½ | .02¾   |
| Shamrock Cons. ....           | .20½ | .21    |
| Temiskaming. . . . .          | .59½ | .60    |



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Map 66A. Brechin Sheet, Ontario and Victoria Counties.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

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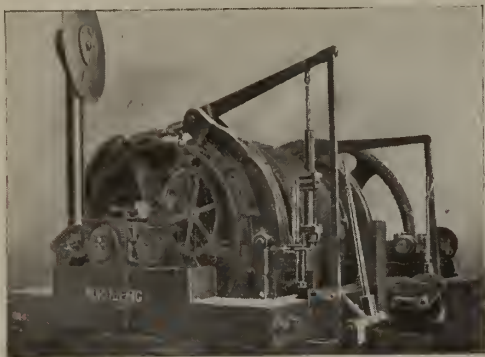
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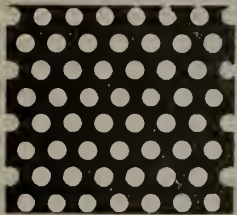
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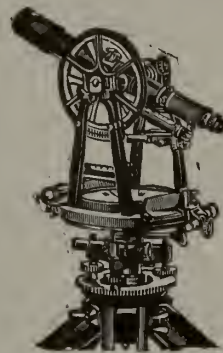
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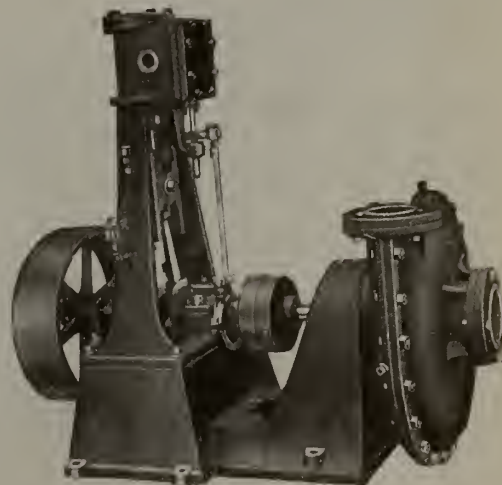
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, February 15th 1917.

No. 4

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

Head Office - - - 263-5 Adelaide Street, West, Toronto  
Branch Office - - - 600 Read Bldg., Montreal

Editor

**REGINALD E. HORE**

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### CIRCULATION

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

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## UNITED STATES BREAK WITH GERMANY

As was to be expected, the United States has shown itself unwilling to continue friendly relations with the criminals who calmly announce their intention to murder those whom their submarines encounter in certain areas of the free seas. While word of Mr. Wilson's action was joyfully received in Canada; and throughout the civilized world, we doubt whether there is anywhere more satisfaction at the President's action than in the United States.

Many Americans since they learned of the horrors of the invasion of Belgium, the murder of innocents on the Lusitania, and other Hun barbarisms, have felt dissatisfied with their part in world affairs. They have tried their best to maintain neutrality, because of the President's appeal. They have found this role rather irksome, but have been very patient. Now at last their confidence, somewhat shaky at times, in the President has been justified.

Owing to the direct way in which the Germans this time strike at all neutrals and proclaim their criminal intentions there can be little doubt that Americans now realize more fully that regard for humanity is second in the German mind to military expediency. There can be little doubt therefore that if President Wilson finds it necessary to ask Congress to take the next step, he will have the full support of the American people.

We congratulate our neighbors on the new position which they have now taken in the eyes of the world. We hope they will not find it necessary to follow up their action by joining in the war; but we are glad to have from them this recognition of the fact that the Allies are fighting in the interests of humanity against a powerful and ruthless enemy.

Germany in risking war with the biggest neutral doubtless regards our neighbor as unable to assist the Allies to an extent that would counter the advantages to be gained by unrestricted submarine warfare. We have however a high regard for the abilities of American industrial leaders and for the average American's love of his country and his country's ideals. If President Wilson calls the citizens of the United States to arms in the defense of their rights and their principles there will be a response that will soon be felt in Berlin.

The preliminary program for the annual meeting of the Canadian Mining Institute indicates that some very interesting sessions will be held. There are to be addresses on such subjects as Industrial Preparedness, Industrial Relations and Industrial Research, as well

as several technical papers on subjects that are of unusual importance at the present time. A list of the papers appears elsewhere in this issue. The meeting will be held in Montreal, March 7th, 8th and 9th.

### FILL IN THE CARDS

There was recently organized in Toronto a committee, composed of representatives of the various technical organizations having branches in Toronto, whose object is to assist the government in the prosecution of the war. This committee has held several meetings during the past month and it seems likely that the committee will be able to make the services of technical men more readily available for war purposes.

As one result of the meetings held during January the committee is now endeavoring to obtain information concerning the qualifications and experience of all the technical men in Ontario. With this object cards are being distributed and it is hoped that they will be promptly filled out and returned by those who receive them. Owing to the very incomplete lists now available many technical men will not receive these cards. It is therefore particularly desirable that requests for cards be sent in by those who wish to assist the committee in making the files complete.

Those mining men in Ontario who are members of the Canadian Mining Institute will receive the cards. There are many others whom the committee will not be able to reach without some assistance.

We urge mining men in Ontario to fill out their cards promptly and return them. We further urge that the names of technical men who do not receive cards by Feb. 15, be sent to the secretary of the committee.

The taking of a technical census is of course only a small part of the work of the committee. It is however an important part and as it is the first in which all technical men in Ontario have been asked to cooperate it should be made a success. Do not be satisfied with sending in your card therefore; but do whatever you can to make the list of technical men engaged in the mining industry complete.

### LABOR AFTER THE WAR

Owing to the present great industrial activity in most parts of the world and owing to the large number of men being used in the great armies in Europe there is at present a great demand for men and wages are high. In some quarters there is therefore considerable uneasiness concerning what will happen when the war is over, if it is found impossible to continue paying high wages.

Writing on this subject in the February number of "Industrial Management," Mr. Lewis R. Freeman makes some statements which may help to dispel the fears that have been expressed and point out the way in which the difficulty may be overcome. Mr. Free-

man emphasizes the fact that present conditions are the natural result of supply and demand; there is more work to be done and fewer men to do it because so many are on military duty. This condition he expects to continue for some time after the war because so many formerly productive men are being killed or incapacitated and because of the expected demand for reconstructive work. He believes however that co-operation between labor and employer may result in conditions being not worse after the war, but better. He says:

"At a time when the cloud of industrial dissension looms darker on the horizon than ever before, it may be well in point to call attention to the sane and earnest efforts the British employer and workman—both chastened in spirit by the great war in which each is playing so crucial a part—are making to "get together" in the matter of their differences. How far they have already progressed—in thought, if not in action—will be evident from the two following extracts from letters which I find in a recent issue of the London Times Trade Supplement. The first is from a labor correspondent:

"To promote good understanding there should be, in all big works, what I may call workshop consultative committees. The men should be invited to elect representatives to form these committees, along with an equal number of foremen, managers, directors or shareholders. The committees should meet regularly, and freely and frankly discuss anything and everything of mutual interest. The employers should explain their difficulties; the men their grievances. Grievances could be remedied in their earliest stages, whereas at present they are seldom brought to the notice of employers until they develop into strikes, or threats of strikes, after causing much discontent. On the other hand, the employers or management could often explain difficulties to the men, and get their loyal support where at present the men are unaware of such difficulties."

"The other letter is from a large firm of manufacturers:

"One can only witness the antagonism between labor and capital with feelings of sorrow. Speaking as employers, and in the assurance that employers generally are with us, we feel that the time has come when some bold step should be taken. Leaving out of consideration the question of bias, it must be agreed that there are many excellent ideas on both sides which could be welded into one great and beneficent scheme. Should it not therefore be possible for a select committee, representing employers of various trades, to meet a corresponding committee composed of the trade union leaders? If these gentlemen could only get together, firmly determined to make an absolutely square deal, a result far exceeding our highest expectations might be attained."



"It is this very widespread spirit of mutual consideration and conciliation that bids fair to bring Great Britain—on the heels of a political peace—nearer to the prospects of an industrial peace than she ever dared dream of in the decade preceding the great war. Is there no lesson in this for America, or must she, lacking the chastening influence of a great international war, fritter away her energies in continued and increasingly bitter and costly industrial war within her own borders?"

Mr. Freeman looks hopefully ahead and tactfully suggests that if serious disruption in industries follows the war it may be not wholly because of unreasonable demands of labor on industries that cannot continue to pay wartime wages; but because of failure of employer and employee to "talk it over."

## CORRESPONDENCE

### FOREIGN CONTROL OF CANADIAN MINES.

Editor, Canadian Mining Journal:

Sir,—Enclosed I send a clipping from a local newspaper purporting to give an account of an interview at Vancouver, B. C., with "Mr. F. H. Phippen, Chief Counsel for the Canadian Northern Railway," which account you may be inclined to reprint for the information of mining men in Ontario and other parts of Canada in which your journal is circulated.

May I venture the opinion that it might be well for the Canadian Northern Railway to instruct those prominently associated with its business affairs to refrain from meddling with matters connected with the mining industry of this province, to which it looks for considerable support, whatever they may do relative to that of Ontario. To those of us who have had many opportunities to observe the generally disastrous outcome of mining enterprises in British Columbia undertaken by British companies, whether Canadian or Old Country (with the outstanding exceptions of the Consolidated Mining and Smelting Company of Canada, Limited, and the Crow's Nest Pass Coal Co., and the far less conspicuous success of an occasional much smaller organization), the frequent "butting in" of politicians, or self-styled experts, or even of eminent lawyers, is a matter of deep regret. Further, the flagrant inconsistency of urging the development of the natural resources of the country, as is the commendable custom of numbers of public-spirited men, on the one hand, and of agitating for cutting off the main, if not the only source of capital available under existing conditions for new mining enterprises in Western Canada, as some others are doing, on the other hand, brings about a situation sometimes hampering and perplexing, and at others quite prohibitive of development and substantial progress.

Having in mind the fact that many British owners of mineral claims, as well as foreign owners (and it occurs to me that certain men at the head of the Canadian Northern Railway have been among the former) have held them inoperative for years, and that so far as British Columbia is concerned there is nothing to prevent a continuance of such a paralyzing policy, is it not better to offer even greater inducements to "foreign" capital, rather than to stir up agitation to frighten it away. Certainly the mining industry of

this province would be in a very bad way were it not for the enterprising activity and abundant financial support of United States' capitalists. Why, then, should the mining industry in its need of money for development be debarred from accepting aid from men who know how to make a success of mining, and do so far more often in the West than do Britishers? Has any one ever heard of British companies operating in foreign lands in Siberia, in Spain, in South America, and in the United States? And why should they not if they have the requisite money?

If it be permissible for the Canadian Northern Railway or any other transportation or manufacturing or development enterprise to go to the United States for money for its legitimate purposes, why may not the mining and metallurgical enterprises of Canada do likewise? Whether Mr. Phippen's grandiloquent sentiment, "if we cannot develop our own resources and obtain the full benefit from them, then those resources should not be developed," is practical or is utopian may be a matter of opinion. Probably the great majority of those in British Columbia who are directly interested in productive mining and allied industries will be quite content for that gentleman to experiment in the province from which he comes, but few, if any of them are likely to welcome his efforts along such precarious lines in this part of the Dominion.

Yours, etc.,

Victoria, B.C., January 26, 1917.

E. JACOBS.

The clipping from the "Colonist," referred to by Mr. Jacobs follows:

In an interview at Vancouver, Mr. F. H. Phippen, chief counsel for the Canadian Northern Railway, expressed himself as believing that the Federal Government should take drastic steps to prevent the natural resources of the Dominion falling under the control of foreigners.

"What benefit to Canada are the mines we now have?" he asked. "They have been financed by outside capital and the dividends are sent away from Canada. The only good our country gets out of the resources which are now under development is the support of the workmen who are employed at the different mines.

"This is but a trifle. Canada should benefit entirely from her natural resources. All the money should be kept within the Dominion."

Asked if it would not possibly discourage development if foreign capital was forbidden investment in Canadian mines, Mr. Phippen declared that if this was the result it would be better to leave the properties undeveloped until Canadian capital could be obtained. With foreigners benefiting, Canadians were being robbed of their heritage.

"Canada should be for Canadians only," declared Mr. Phippen. "If we cannot develop our own resources and obtain the full benefit from them, then those resources should not be developed.

"As it is now our natural resources are being wasted to Canada. For all the good our great mines are doing us they might as well not be in Canada. Take for instance the valuable mines of Northern Ontario. The dividends from those mines are in large part being sent across the border. Americans are deriving the benefit."

The judge is convinced that there is a great future ahead of Canada as a mining country. It will be, he believes, the greatest mining country in the world.



On the question of making operative his restriction of investment scheme, the judge stated that it was too late to consider applying the rule to the mines now in existence. But the Government should pass an enactment which would restrict investment in mines to be opened up in the future to Canadians only. Then in the tremendous development to come, Canada would get the whole benefit.

### A SUGGESTION.

Editor, Canadian Mining Journal:

Sir,—In the editorial in your issue of the 15th you invite suggestions dealing with the removal by, as you term it, united effort, of obstacles encountered by those who have been trying to develop ore deposits and increase production of raw materials.

As you are aware, during the last six years, suggestions have been made, through the public press, through delegations, and through the associated Boards of Trade of Northern Ontario, asking for the removal of these very same obstacles. In 1911 we were told by Hon. Frank Cochrane, that the Government's policy was to protect its forest resources rather than to encourage further encroachment by prospectors, miners or railroads. The people asked for bread and were given a stone.

It is true that the Legislature made an appropriation of money for the purpose of giving the aid asked for. But as long as the Cabinet Ministers are able to ignore the wishes of the House and to use money so appropriated, for other purposes, Legislative action alone does not relieve the situation.

It is evident, from the statement by Hon. Frank Cochrane, that he was acting as Minister of Lands and Forests. There are no indications that he was acting as a Minister of Mines.

In view of past experience, it seems to me that in order to get any assistance that might be needed in order to facilitate increased production of raw material from the mines it will first be necessary that the industry be represented in the Cabinet and I, therefore, suggest that the mining men of Ontario ask for and insist on getting as Minister of Mines one who is not tied to the apron strings of any other industry.  
West Shining Tree, January 29th, 1917.

L. O. Hedlund.

### GRANBY.

Estimated earnings of Granby Consolidated for the six months ended Dec. 31, 1916, were \$2,533,079, less dividends of \$600,000, leaving a surplus of \$1,933,079.

The report shows that there were treated during the six months ending Dec. 31, 1916, at Grand Forks smelter 464,927 dry tons, and at Anyox smelter 446,857 dry tons, a total of 911,764 dry tons.

Production of metals was as follows:—

|                         | Pounds.    | Ounces. | Ounces. |
|-------------------------|------------|---------|---------|
|                         | Copper.    | Silver. | Gold.   |
| Anyox smelter . . . . . | 16,179,521 | 193,142 | 4,681   |
| Grand Forks Smelter . . | 6,351,710  | 78,362  | 13,228  |
| Total . . . . .         | 22,531,231 | 271,504 | 17,909  |

According to the Revelstoke Review, Alberta and Seattle men have organized the Circle City Mines, Limited, and have bonded a group of mineral claims situated in the Lardeau country. It is stated that an adit, driven 80 ft., has cut a 6 ft. lode of ore containing silver and lead.

### HOW MOLYBDENUM CONCENTRATES ARE MARKETING.

The basis on which molybdenum ores and concentrates are bought and sold varies according to whether the contained molybdenum mineral is molybdenum or wulfenite. Molybdenum products are invariably purchased on the basis of their molybdenum content, reckoned as  $\text{MoS}_2$ , whereas wulfenite is always bought either on the basis of its molybdenum content expressed as metallic molybdenum or as  $\text{MoO}_3$ . It is unfortunate that custom should have established these three methods of calculation where one, based on the content of metallic molybdenum, would have sufficed and avoided needless complications and frequent misunderstandings between buyers and sellers. In connection with the use of these three standards it may be of interest to note that 1 part by weight of  $\text{MoS}_2$  is equivalent to 0.9 part of  $\text{MoO}_3$  and to 0.6 part of Mo, and, inversely, that 1 part by weight of Mo is equivalent to 1.5 parts of  $\text{MoO}_3$  and to 1.67 parts of  $\text{MoS}_2$ .

In Canada and the United States the short ton of 2,000 pounds is the measure of weight used in buying and selling of molybdenum ore, and quotations are generally based on the number of units of 20 pounds each of pure Mo,  $\text{MoO}_3$ , or  $\text{MoS}_2$ , contained in a ton. In Europe, on the other hand, the long ton of 2,240 pounds is almost invariably used, and accordingly European purchasers settle on the basis of a unit containing 22.4 pounds. Quotations both in this country and abroad are generally made on a sliding scale to cover various grades of material. Specifications usually state the minimum percentage of Mo,  $\text{MoS}_2$ , or  $\text{MoO}_3$  in the ore or concentrates that is acceptable to the purchaser, and also the maximum percentage of objectionable elements, such as copper, tungsten, bismuth, arsenic, and antimony that will be allowed. Just what are objectionable elements depends largely on the use to which the molybdenum product derived from the concentrates is destined and the methods employed in treating it. Copper and tungsten seem to be universally objectionable both to the iron and steel and to the chemical trades. Copper is particularly undesirable and its presence in excess of 1 per cent., even in high-grade molybdenite concentrates, is usually sufficient to render the material unmarketable. Some dealers will, however, accept concentrates containing more than 1 per cent. copper, but when 4 or 5 per cent. copper is present the penalties exacted are such as to be prohibitive. Likewise, some dealers have no objection to the presence of small quantities of arsenic and bismuth in molybdenite concentrates, as they state that these elements are readily volatilized when the ore is roasted in the process of treatment. Up to 1914 it was difficult to sell molybdenite concentrates containing less than 80 per cent.  $\text{MoS}_2$ , or wulfenite concentrates with less than 25 per cent.  $\text{MoO}_3$ , but at present molybdenite and wulfenite concentrates containing as low as 20 per cent.  $\text{MoS}_2$  and 18 per cent.  $\text{MoO}_3$ , respectively, can be marketed.—F. W. Horton, U. S. Bureau of Mines.

Development of the Oregon mineral claim, situated in Camp Hedley, Similkameen district, is to be resumed. Tenders have been invited for extending an adit, now in about 130 ft., for 75 to 100 ft. The claim is owned by Mr. F. H. French, of Hedley, and some associates resident on the Coast.



# COPPER MINING IN BRITISH COLUMBIA

By E. Jacobs.

Copper mining is making greater advances in British Columbia than is any other branch in that, the most westerly province of Canada. The estimated output for 1916 was approximately 70,000,000 lbs., which compares with 56,918,000 lbs. in 1915, and 51,456,000 lbs. in 1912, those being the only other years in which the production of this metal exceeded 50,000,000 lbs. The yearly average for the five-year period 1911-1915 was 47,354,520 lbs., the quantity produced in 1916 was nearly 50 per cent. greater than that average.

The first recorded production of copper in the province was that of 324,680 lb. in 1894; for the eight-year period, 1894-1901, the total output on official record was 63,016 lbs. For the three five-year periods since 1901 the figures are as follows: For 1902-6, 180,389,000 lbs.; for 1907-11, 208,876,000 lbs., for 1912-16, 269,845,000 lbs. The total production in 23 years, 1894-1916 (that for 1916 estimated) has been 722,126,000 lbs. While revised returns for 1916 will probably show a somewhat higher production in that year, it is not expected the difference will be as much as 1,000,000, so it will not materially alter the position as above outlined.

The chief copper-producing district of British Columbia until 1914 was that known as the Boundary, comprising Grand Forks and Greenwood mining divisions, in which the Granby Consolidated and British Columbia Copper companies (with preliminary development organizations) have been operating more than twenty years. In 1914, however, what is known as the Coast district, came into greater prominence, this including Vancouver mining division in the southern part, in which the Britannia Mining and Smelting Co.'s mines are situated, and Skeena mining division in the northern part, in which the Granby Consolidated Co. also commenced producing copper in 1914, these together being on a larger scale than Boundary. Approximate figures for 1916 indicate the position as regards sources of copper production in the province to-day, as follows: Northern Coast, 29,971,000 lbs.; Southern Coast, 18,765,000 lbs.; Boundary, 16,158,000 lbs.; Trail Creek (Rossland), 3,986,000 lbs.; other parts 1,120,000 lbs.; total 70,000,000 lbs.

The following table shows the quantities of copper from the several producing districts for all years to date.

|                                                                           |                  |
|---------------------------------------------------------------------------|------------------|
| Boundary . . . . .                                                        | 413,557,000 lbs. |
| Coast (Southern, 121,300,000 lbs.,<br>Northern, 67,571,000 lbs) . . . . . | 188,871,000 "    |
| Trail Creek Division (Rossland) . . . . .                                 | 101,698,000 "    |
| Nelson Division (West Kootenay) . . . . .                                 | 15,000,000 "     |
| Other parts . . . . .                                                     | 3,000,000 "      |
| Total for all years, 1894-1916 . . . . .                                  | 722,126,000 "    |

While the greater part of the copper produced in the Northern Coast district has come from the Granby Consolidated Co.'s Hidden Creek Mine, near Observatory inlet, about 5,000,000 lbs. was produced in 1915 and 1916 from the Rocher Debole Copper Co.'s mine in Omineca mining division. There is promise of a steadily increasing output from the Skeena region and other parts of the northern country. In the southern

part of the province, in Similkameen division, west of the Boundary district, the British Columbia Copper Co. has developed ore in considerable quantity in a group of mineral claims on Copper mountain, within a dozen miles of Princeton, the most important of the several small towns in the Similkameen district.

The companies producing considerable copper in the province are the Granby Consolidated, British Columbia Copper, Consolidated Mining and Smelting Company of Canada, and Britannia Mining and Smelting Co. Among the smaller producers are the Rocher Debole Copper Co., already mentioned; the Kamloops Mining and Development Co., which has just started concentrating copper ore near its mines in Ashcroft division, Yale district and several others in Yale or Coast districts.

Information relative to reserves of copper ore and to metal contents or recoveries from ore mined and treated in several recent years has been obtained from various sources. From the following figures an idea will be obtainable as to (1) the estimated quantities of ore available for mining in some of the mines that have been largely productive in recent years, and (2) the metals contained in a part of the ores already disposed of.

The Granby Consolidated Company estimated, at the close of its last fiscal year, that the ore remaining in its mines at Phoenix, Boundary district, totaled 3,610,996 tons, from which a recovery of 17 lbs. of copper and 75 cents in gold and silver to the ton can be made; also that 400,000 tons of ore that will yield 9 lb. of copper and 60 cents in gold and silver may be estimated. The last annual report showed that the recoveries from 1,097,299 tons of ore from the company's Phoenix mines averaged 14.6 lb. of copper and \$0.779 in gold and silver per ton, the quantities of the several metals recovered having been 15,992,476 lbs. of copper, 204,779 fine oz. of silver, and 36,801 fine oz. of gold. Estimates of ore reserves at the company's Hidden Creek mine, near Anyox, Observatory inlet, were: Of high-grade ore 2.37 per cent. 9,416,385 tons; of low grade ore 0.63 per cent., 8,601,635 tons; total 18,018,020 tons. Bonanza mine reserves are placed at 414,775 tons of 2.19 per cent. ore, and 489,580 tons of 0.70 per cent. ore; total 904,355 tons, averaging 1.60 per cent. copper. Metals recovered from 722,630 tons of Hidden Creek ore were: Copper, 24,012,838 lbs., or an average of 33.23 per cent.; silver, 186,041 oz., and gold, 4,928 oz., or an average of \$0.297 a ton in gold and silver.

The Britannia Mining and Smelting Co.'s report to the end of 1915 gave information concerning the company's Fairview mine ore reserves as follows: Broken ore in stopes, 578,206 tons; ore developed in place, 2,855,947 tons; probable ore, 2,544,000 tons; possible ore, 4,275 250 tons; total, 10,253,403 tons of an average of two per cent. copper. A corresponding estimate of ore in the company's Bluff, Jane and Empress mines gave a total of 6,944,386 tons, average 1.53 per cent. copper. These figures together give a total in excess of 17,000,000 tons of ore. Available figures show that the actual production of the Britannia company in four years, 1913-1915, was approximately 1,087,000



tons of ore which was concentrated into 173,800 tons of shipping product with metal recoveries as follows: Copper, 52,000,000 lbs.; silver, 289,000 oz., gold, 1,536 oz. This company is the operating company in British Columbia of the Howe Sound Company, of New York.

The British Columbia Copper Co., which is controlled by the Canada Copper Corporation, Limited, New York, after about fifteen years of productive operation in Boundary district, does not report any considerable reserve of known ore in its mines there, though it owns mines just across the International Boundary line, in the State of Washington, from which it still obtains ore for smelting at its works at Greenwood, B.C. Its most important operations now are on Copper mountain, Similkameen district, where it is preparing to mine ore, estimated as at December 31, 1915, to be in quantities as follows: Reasonably assured ore, 9,075,000 tons; probable ore, 2,000,000 tons; total, 11,075,000 tons. The average grade of this ore is estimated at copper 1.75 per cent. and gold and silver 20¢ a ton (recoverable value). Underground development of these orebodies is in progress and the installation of concentrating plant is being prepared for.

The mines at Rossland of the Consolidated Mining and Smelting Company of Canada, Limited, contain ore the chief valuable metal content of which is gold. No figures as to estimated ore reserves have been made public, but it is well known that the condition of the company's Centre Star War Eagle, Le Roi, and other mines of the big group in Rossland camp is favorable to many years of further productive operation. A good idea of the grade of the ore may be obtained from the following figures showing the production of four years, 1911-1914: Ore mined and smelted, 915,597 tons; gold, 459,691 oz., silver, 317,832 oz.; copper, 11,684,515 lbs.

From Seattle, Washington, has come the statement that more than a ton of gold, the biggest shipment of the new year, valued at about \$500,000, constituted part of the cargo of the steamship Mariposa, of the Alaska Steamship Co., which docked at Seattle from the North on January 17. The gold, it is announced, was taken aboard the Mariposa at Seward, where it arrived on January 9. It was transported on four dog sleds from the Iditarod district to Forty-Mile Station on the U. S. Government railway and taken thence to Seward by special train. The trip of 500 miles from the Iditarod to Forty-Mile was made with the temperature from 20 to 30 degrees below zero. The treasure was in charge of Mr. Robert Griffith and Capt. A. E. Healey of the Wells Fargo Express Co., and two assistants.

A press despatch from Wrangell, Alaska, states that John Finlayson, a famous explorer, after whom Finlayson River and Finlayson Lake, in Yukon Territory, were named, is dead, at the age of 105. His age was well authenticated. He was a native of Scotland. He prospected and mined gold in Oregon and thence to Yukon Territory. He explored large areas into which white men had never before penetrated. He always prospected for gold and was one of the first to enter the Stikine and Cassiar regions of British Columbia. Many years ago he retired to Wrangell with what he supposed was a sum ample to meet all his needs, but he had not expected to attain so great an age, and two

years ago he was obliged to apply to the Pioneers' Home, at Sitka, Alaska, on a pension to which he was entitled by law.

### HEDLEY GOLD MINING CO'S MILLING PRACTICE.

After describing, at considerable length, in Mining and Scientific Press, the Hedley Gold Mining Co.'s Nickel Plate group of mines and 40-stamp mill in Camp Hedley, Similkameen district, British Columbia, Mr. T. A. Rickard, says:

"At the present time the total extraction at Hedley is 88 per cent., of which 70 to 75 per cent. is by concentration, so that it is evident that cyanidation presents a minor part. The position is to be reversed. The idea now is to slime everything, treat with cyanide, return the tailing over vanners and either cyanide the re-ground concentrate or ship it to the smelter, in proportion to the lowering of the freight-rate by the railway company. Tests have been made, using ten stamps, or a quarter of the mill. These tests have yielded an 86 per cent. recovery by direct cyanidation and 9 per cent. more in a marketable concentrate. Formerly the concentrate assayed 4 to 6 ounces in gold per ton; now, after cyanidation, the assay has declined to about \$25 per ton. The concentration used to be in the ratio of 10:1 on 600 tons of concentrate monthly; now the shipments will be 100 to 125 tons only.

"The plan of treatment now to be adopted may be sketched thus: Crushers, 40 stamps, spitzkasten, the coarse going to eight corrugated-belt vanners, the tailing from which is returned to two tube-mills. The fine from the stamps and the tube-mills is delivered to 12 Deister tables and 16 smooth-belt vanners, the tailing from which is re-classified by four cones, the spigot-discharge being further classified in cones with upward flow of water. The slime from both sets of cones goes to one set of cyanide vats and the sand to another set.

"The treatment of the residue for the further extraction of the gold and for the recovery of the arsenic depends upon the freight and smelter rates to be obtained. Like the tariff, metallurgy is a local question."

### ALGOMA IRON ORE AND PYRITES.

The chief producing iron ore mines in Ontario are the Helen and Magpie mine owned by the Algoma Steel Corporation.

During 1916 the Helen produced 85,241 gross tons iron ore and 6,624 gross tons pyrites. There was shipped to the Soo furnaces 40,660 gross tons and to the Magpie roaster 57,343 tons high sulphur ore. This Helen high sulphur ore is mixed with Magpie raw ore and then roasted, producing a very desirable Bessemer ore, running 52 per cent. iron and 0.043 phosphorus.

Of the pyrites 3,120 tons was shipped to the Soo, and the balance stockpiled.

The total tonnage shipped from Helen Mine since 1900, the opening, is 2,409,971 gross tons iron ore and 40,690 gross tons pyrites.

During 1916 there was mined at the Magpie 208,163 gross tons iron ore. There was shipped 187,966 tons, of which 108,478 tons went to Lake Erie ports to fill contracts with U. S. furnace companies and the balance to the company's furnaces at Sault Ste Marie. Since opened in 1913 the Magpie has produced 424,816 gross tons of which 161,119 tons was exported and the balance used at the Soo furnaces.



# TRANSVAAL GOLD MINING IN 1916

By Rowland Gascoyne

Notwithstanding the war, and the difficulty experienced with regard to labor and supplies, the gold production in 1916 in the Transvaal is estimated to constitute another record. The Rand Goldfield practically produces the whole of the gold in the Transvaal, and for 1916, the production is estimated at 8,971,564 ozs., value £38,108,797, as compared with 8,771,919 ozs., value £37,260,746 for 1915, which for any one year was the highest output previously obtained. A feature of the year was the intersection of the Main Reef Series below the South Rand Dyke by a borehole apparently in a profitable condition, but otherwise no important discovery was made during the year.

During the year what will probably prove of immense importance was the result of Dr. Mellor's work of the Geological Survey in connection with the Far East Rand Goldfield. Dr. Mellor shows that the reef in that goldfield was deposited in elongated patches, whose long axis shows a definite roughly parallel direction, alongside areas completely barren of reef with the hanging and footwall in contact. Further where the reef is found well developed and of workable width profitable values may be expected. As the Far East Rand Goldfield is many square miles in extent, and the only part of the Rand to which future increases of gold production can be looked for, this discovery will prove of the highest importance, as it will materially assist prospecting operations, on account of indicating the position where payable and unpayable areas may be looked for.

Except in the Far East Rand little prospecting with the diamond drill was done during the year, and here the boring seems to have been done principally in unprofitable or barren areas. Owing to the falling values at the East Rand Proprietary Mines in depth, a somewhat ambitious prospecting scheme was decided upon. It was decided to drive two converging cross cuts 2,000 feet in length, and where the cross cuts intersect each other, to sink a shaft 2,000 ft. deep to prove the value of the reef. At this point the depth from the surface to the reef will be no less than 6,000 ft., and the work is expected to last about four years and to cost £200,000.

Several new shafts were started during the year to the immediate south of Johannesburg, where the depth to the reef will be about 4,500 feet. One of these shafts circular in shape, No. 14, of the Crown Mines, has eclipsed the world's previous record for speed having sunk 252 feet in one month. A deep shaft has also been started at Daggafontein near Springs, which is expected to reach the reef in five or six years.

During the year much trouble and expense has been caused to the deep mines, working at vertical depths of from 4,000 to 5,000 ft. by the pressure and movement of the superincumbent strata. Masonry and reinforced concrete have been tried without relief, and ever larger pillars have failed to withstand the pressure. The only reliable preventative appears to be sand-filling, upon which considerable sums have been spent during the year. For several years in the town and neighborhood of Johannesburg, these subsidences have produced earth tremors similar to earthquake shocks, and a Government Commission was appointed to investigate and report upon the matter. After an exhaustive enquiry, the Commission confirmed the view, as to their origin being due to mine subsidences, and recommend that larger pillars be left for the pro-

tection of the workings to be entirely removed later on. The depreciation of values in depth at the East Rand Proprietary Mines was one of the features of the year, as was also the failure of selective mining when tried at the Crown Mines.

It is now generally conceded that the future of the gold mining industry on the Rand depends on the Far East Rand, a deep lying goldfield some 400 sq. miles in extent north-east and east of Boksburg. During the year interest has been almost exclusively centred in this field, three-fourths of which area belongs to the Government. It is not expected that more than one-half of this goldfield will prove profitable, but even then the Government Mines Department estimated during the year, that the yield of this field might be placed at £450,000,000. Several attempts have been made by three Governments without success, to lease certain of these mining areas. During the year two mining areas were offered on more liberal terms and brought forth nine tenders. For the area adjoining the Brakpan mines, the tender of the Brakpan Mines was accepted at five per cent. of the profits for the first five years, over the whole of the Brakpan farm and Schapenvryst, and 12½ per cent. minimum afterwards. The tender of the Central Mining and Investment Corporation was accepted at 10 per cent. of the combined profits of the leased area along with Rand Klipfontein and Cloverfield. In order to facilitate the leasing of the mining rights on the Far East Rand, the Government after instructing the Mines Department to report upon the matter, proposed new mining legislation, with the object of making the terms more attractive to investors. Owing, however to an outcry that the Government should work the mines themselves by means of State mines and thus secure the whole of the profits, the Government appointed a Commission to investigate and report upon the merits of State mining. This Commission was still pursuing its labors at the end of the year. As it will take about eight years for these deep mining areas on the Far East Rand to produce gold, and many important mines on the Central Rand are fast approaching exhaustion, it is anticipated that the gold output of the Rand may possibly decline before these new mining areas can contribute to the Rand gold output. Owing to the impossibility of raising capital in Europe for the purpose of opening new mines on the Far East Rand, Messrs. Lewis and Marks attempted to raise capital during the year in the United States. Several engineers visited the Far East Rand to report but owing to the uncertain mining legislation, the efforts were unsuccessful.

The condition of the South African coal trade materially improved during the year, owing to the Suez canal route being abandoned by many of the shipping lines in favor of the Cape. This gave quite an impetus to the bunkering trade at Durban and Capetown, with the result that both the output of coal and selling prices increased during the year. The diamond mining industry materially improved during the year. In 1915 the value of the output was under £400,000. By June it had reached two millions sterling, and in October seven millions, so that in 1917 the old output of eleven millions will be easily reached. In the base metal mines there was a good feeling during the year, asbestos, lead and mica showing the most improvement, copper and tin remaining steady.



### FLORENCE SILVER MINING CO.

For several years the Florence Silver Mining Co., of Spokane, Washington, has been developing a group of mineral claims situated a mile or two north of the town of Ainsworth, on the west side of Kootenay lake, British Columbia.

The published report of the gold commissioner for the district for the year 1911 included the statement that "the Florence Mining Co. is driving a tunnel to a depth of 500 ft. on the Hope property, and is confident that it will be well repaid for the labor." For 1912 the official report was that the company had "employed an average of ten men on development work; sunk a shaft to a depth of 80 ft.; did 200 ft. of drifting and shipped about 60 tons of ore; built a new shaft-house, cook-house, several dwelling houses, and two miles of road to connect with the Government road on the lake shore." For 1913 the commissioner reported that the company had employed on an average ten men during the year, mined about 100 tons of ore, and installed two air compressors. For 1914 the report was to the effect that the company had shown up large quantities of clean and milling ore, and that it was its intention to erect a concentrator near Princess Creek. The 1911 report stated that the company's property "had just entered the shipping list; arrangements were made to mill the ore at the Highland mill, near Ainsworth, late last fall, but through lack of water it shut down. A new camp for forty men was erected and a hydro-electric plant was installed on Woodbury creek. Ten men were employed."

#### Progress in 1916.

The following summary shows that substantial progress was made in 1916:

**Development.**—No. 3 tunnel, which will give an additional depth of 350 ft., as compared with the present workings in ore, has been driven a distance of 1,500 ft., with 500 ft. yet to go to reach its objective point. In addition there has been approximately 1,500 ft. of development work done in raising and drifting.

**Production.**—The ore-production in 1916 was entirely incidental to development, and consisted of 660 tons of silver-lead concentrate and 134 tons of crude ore, all of which was shipped to the Consolidated Co's smelter at Trail. Concentration of the ore was done at the Highland mill.

**Equipment.**—The equipment provided was as follows:

A power plant for air, consisting of a 250-horse power Ingersoll-Rand compressor (15-drill), direct connected to water wheel, with one mile of 6 in. pipe from the plant to the mine, was completed at a cost of about \$15,000.

A hydro-electric plant of 350 horse-power, with two miles of transmission line from the generating station on Woodbury creek to the concentrating mill on the western shore of Kootenay lake, was completed at a cost of about \$35,000.

A concentrating plant, with a capacity of 300 tons daily, was put in at a cost of about \$80,000. This plant will be in operation early in 1917.

An aerial tramway from No. 3 tunnel to the concentrating mill, a distance of 1,800 ft., equal to conveying 25 tons an hour, was constructed at a cost of about \$8,500.

#### Geology and Ore.

Mr. Stuart J. Schofield, in the Geological Survey Summary Report for 1914, gave the following information relative to the claims operated by the Florence Silver Mining Co. of which Mr. F. R. Wolfe, of Spokane,

is president and manager, and Mr. Charles Simpkins mine superintendent:

"The country rocks on these claims are all sedimentary, consisting of interbanded siliceous limestones and mica schists striking north and south with a dip of 45 deg. to the west. The vein which cuts this sedimentary series strikes N. 65 deg. W. and dips 60 to 75 deg. S.; it varies in width from a few inches to 16 ft. This variation in width is due to the character of the country rocks crossed by the fissures. In the mica schists the vein is barren, but where it crosses the siliceous limestone a great enlargement takes place which is in the nature of a replacement deposit. Locally these enlargements are called cross veins. The ore consists mainly of coarse-grained galena with subsidiary amounts of zinc blende and iron pyrites. The gangue is mostly quartz and silicified limestone."

#### CREDIT TO WHOM CREDIT IS DUE.

Writing to Mining and Scientific Press, Mr. E. H. Hamilton, of Trail, B.C., now metallurgical manager for the Consolidated Mining and Smelting Company of Canada, Limited, who is too just and big a man to take credit due to others, makes it quite clear who it was that did so much of the preliminary difficult work in connection with the establishment of an electrolytic zinc refining industry at Trail. His letter, published in Mining and Scientific Press of January 20, follows:

"Sir,—In your issue of December 30, the editorial on electrolytic zinc at Trail seems to infer that I had to do with designing the plant. The credit of this is entirely due to Mr. R. H. Stewart, Mr. S. G. Blaylock, and Mr. F. W. Guernsey, and the able staff.

"I can bear testimony to the enormous difficulties overcome in bringing the plant to the operating stage in 11 months, during a period when material, machinery, and men were so difficult to obtain, and while most of the building operations were carried on in the severest winter of many years. The top of the 200 ft. stack was housed and warmed to prevent the material from freezing. Men were hard to get, as one-twelfth of the whole population of the province had volunteered and gone to the front. This included practically all of the unmarried engineers, chemists, and better class of mechanics."

Trail, B.C., January 4.

E. H. Hamilton.

#### WEST SHINING TREE.

Sudbury, Feb. 2.—Mr. Thos. Foster, of West Shiningtree, gave a purchase option for three claims to Mr. Stull, of Sudbury. The property adjoins the Freer claims, controlled by the Canadian Development Syndicate. The south Foster claim shows a four-foot vein of quartz of the Gosselin character, which assayed seven dollars and forty cents.

Mr. De Morest of the firm of De Morest & Stull, engineers of Sudbury, left for Toronto and Ottawa, on Tuesday evening. He stated a very important mining deal was about to be closed for Shiningtree. Stull and De Morest have taken an option on the Moore property controlled by Jack Moore of Sudbury.

Mr. L. La Forest, Mr. John Mataris and five miners left Sudbury for the Mataris Copper property situated about eight miles west of West Shiningtree. A road is now being built into the property from the Shiningtree government road, a distance of six miles. The property will be prospected with diamond drills.—Sudbury Mining News.



**OMINECA MINING DIVISION, B. C.**

The following notes give a brief review of mining in the Omineca division of British Columbia for the year 1916:

Although mining operations were active during the 1916 season throughout the whole district, so far as information received goes there were only two properties from which bulk shipments of ore were made. These are the Silver Standard, about eight miles from Hazelton on Glen mountain, and the Rocher Deboile Copper Co's mines on Rocher Deboile mountain, twelve miles from Skeena Crossing, a station on the Grand Trunk Pacific railway west of Hazelton.

The Silver Standard, which was one of the earliest shippers in the district, in 1913 sent to the smeltery at Trail 282 tons of ore which averaged \$4.20 in gold and 138 oz. of silver to the ton, and 24 per cent. lead, and in 1914 736 tons of ore containing about 200 oz. gold, 122,000 oz. silver, and 282,000 lb. lead. Then came a suspension of production, following the outbreak of War in Europe. However, shipment of ore was resumed in 1916, and during that year there was received at Trail from this mine 738 tons. Reports are to the effect that the mine looks increasingly better as development is proceeded with, and although the owners state that they can hardly claim yet they have an important mine, they have great hopes it will yet prove to be one.

The Rocher Deboile Copper Co's production in 1915 consisted of about 17,000 tons of ore, shipped to the Granby Consolidated Co's smeltery at Anyox, Observatory inlet, which ore averaged about 8 per cent. copper and \$1.65 gold and 50 cents silver to the ton. Shipments in 1916 totalled between 16,000 and 17,000 tons.

Among other properties on Rocher Deboile mountain that have been opened are the Indian, Comcau, Armagosa and Chicago groups, and the Daly West and Ohio mines.

In the Babine region, much development work has been done on the Babine Bonanza and the Debenture groups, both of which are expected to be on a shipping basis before the close of 1917.

On Telkwa river, a great deal of work has been done on the Jefferson-Dockrill group, to which a wagon road is being made. It is expected that ore will shortly be shipped from this property.

A syndicate, with headquarters at Portland, Oregon, has been at work continuously on the Copper Crown group on Blue Grouse mountain, and machinery is in place on this property.

The Fiddler group, on Fiddler creek, was systematically and continuously developed, and the owners constructed a good wagon road to it during the season.

Placer-gold mining was not active, generally speaking, in the district during the 1916 season; however, numerous placer leases, for claims in either the Omineca or the Peace River mining divisions were applied for.

On the whole, the prospects for mining in the district are bright, and it looks as though the 1917 season will prove to be a busy one.

The Silver Gable Mining and Milling Co., has been organized in Spokane, Washington, to do development work on a group of mineral claims situated in the northern part of Ainsworth mining division, near Heal's landing, at the upper end of Howser lake. Mr. W. B. Smith has taken half a dozen men to the property to erect buildings and otherwise prepare camp for mining operations in the Spring.

**ANNUAL MEETING C.M.I.**

The Nineteenth Annual Meeting of the Institute will be held in the City of Montreal on Wednesday, Thursday, and Friday, March 7th, 8th and 9th, 1917.

It is expected that the following papers will be presented for discussion:—

Presidential address on "Industrial Preparedness," by Mr. Arthur A. Cole.

"Organization for Industrial Preparedness," by Mr. E. P. Mathewson.

"A Plea for the Union of Capital and Labor," by Col. D. Carnegie.

"The Amelioration of Industrial Relations," by Dr. David H. Browne.

"The Work of the Advisory Council of Scientific and Industrial Research," by Dr. Frank D. Adams.

"The Organization of Industrial Research," by Mr. Arthur D. Little.

"Electro-Chemical and Metallurgical Possibilities in Canada," by Mr. H. E. Howe.

"Possibilities for the Manufacture of Cyanide in Canada," by Mr. Gordon Spencer.

"The Development of Canadian Magnesite," by Mr. Harold J. Roast.

"Canadian Magnesite and Its Uses," by Mr. H. J. Ross.

"Refractory Clays of Saskatchewan," by Mr. N. B. Davis.

"Potash, Its Production and Uses," by Mr. C. W. Drury.

"Utilization of Canadian Molybdenite," by Mr. J. W. Evans.

"The Concentration and Marketing of Molybdenite," by Mr. H. H. Claudet.

"Beneficiation of Canadian Iron Ores," by Mr. G. C. Mackenzie.

"Bituminous Sands of Northern Alberta," by Mr. S. C. Ellis.

"Electro Deposition of Zinc from Aqueous Solutions," by Mr. E. P. Mathewson.

"Electrolytic Zinc in Eastern Canada," by Mr. E. E. Watts.

"Flotation at the Buffalo Mines, Cobalt," by Mr. T. R. Jones.

"Flotation by the Callow Process in the Cobalt District," by Messrs. John M. Callow and E. B. Thornhill.

"Mining and Milling Practice in the Porcupine District," by Mr. A. R. Globe.

"Metallurgical Practice at the McIntyre Mill," by Mr. A. Dorfman.

"The Kingdom Lead Mine, Ontario," by Mr. John E. Hardman.

"Mining Methods at the Magpie Iron Mine," by Mr. A. Hasselbring.

"Canada in Relation to the Coal Trade of the Empire," by Mr. Allan Greenwell.

"Further Notes on Yukon Mining Problems," by Dr. H. M. Payne.

The Annual Dinner will be held in the Ritz-Carlton Hotel on the evening of Thursday, March the 8th.

By the courtesy of the managements of respectively The Canadian Vickers, Limited, The Dominion Copper Products Company, and the Montreal Ammunition Company, members will be afforded the opportunity of visiting the munition plants of these companies.



## OCCURRENCE AND UTILIZATION OF COBALT ORES\*

Although metallic cobalt was unknown till 1735, when Brandt first prepared it, cobalt ores have been used from very early times for the decoration of porcelain, the production of blue glass, and of smalt and other pigments. Blue cobalt glass has been found in the tombs of ancient Egyptians and in the ruins of Troy. The blue pigment known as smalt was rediscovered in the sixteenth century, when the smalt industry of Saxony was started.

Recent experiments show that metallic cobalt can be used for many purposes with marked success; and only its high price, about four times that of nickel, has prevented its extensive employment in the past.

The word "cobalt" is said to be derived from the "kobolds," the legendary mine goblins. By mediaeval writers it was used for substances which, although resembling metallic ores, yielded no metal on smelting. Later, it denoted a mineral used in the production of blue glass.

### Cobalt Minerals.

The minerals which are of chief importance as ores of cobalt are the arsenide, smaltite, and the sulpharsenide, cobaltite. Absolite, a mixture of hydrates, also forms valuable deposits, and erythrite, a hydrous arsenate formed by the decomposition of arsenical cobalt minerals, is of value as indicating the presence of such minerals. These four minerals are described below.

Among the less abundant cobaltiferous minerals may be mentioned the sulphides linnaeite,  $\text{Co}_3\text{S}_4$ ; carrollite,  $\text{Co}_2\text{CuS}_4$ ; syehnodymite  $(\text{Co}, \text{Cu})_3\text{S}_5$ ; and cobaltnickel-pyrite  $(\text{Co}, \text{Ni}, \text{Fe})\text{S}_2$ ; the sulpharsenides glaucodote,  $(\text{Co}, \text{Fe})\text{AsS}$  and alloclasite, a bismuth-bearing glaucodote; and the arsenides skutterudite,  $\text{CoAs}_3$ , and afflorite,  $\text{CoAs}_2$ . Sphaero cobaltite and remingtonite are cobalt carbonates, the latter being hydrated; heterogenite is a hydrous oxide, bieberite a hydrous sulphate, while cobaltomenite and pateraite appear to be a selenite and a molybdate of cobalt respectively.

Cobalt is also an occasional constituent of many other minerals, especially of pyrrhotite (sulphide of iron) and arsenopyrite (sulpharsenide of iron), and is usually present in nickel ores. Cobaltiferous varieties of arsenopyrite, known as danaitë, are probably due to isomorphous intergrowths of glaucodote. Metallic cobalt has been recorded as occurring in meteorites.

Smaltite, sometimes known as tin-white cobalt, crystallises in the pyritohedral class of the cubic system, combinations of the cube and octahedron are common, but the mineral often occurs massive. It has an imperfect octahedral cleavage and uneven fracture. Its hardness is 5.5 or 6, and its specific gravity is about 6.3. It is opaque, with a metallic lustre, and a color varying from tin-white to steel-grey, tarnishing on exposure. The streak is greyish-black. Smaltite is essentially an arsenide of cobalt,  $\text{CoAs}_2$ . Nickel and iron are both present, and frequently a small amount of sulphur. With increase of nickel the mineral graduates into ehloanthite.

Cobaltite, or cobalt glance, is also cubic and pyritohedral in its crystallisation, the pyritohedron being a common form. It often occurs massive. The cleavage is cubic, and the fracture uneven. It has a hardness of 5.5 and a specific gravity of 6.2. It is opaque, metallic

in lustre, and pinkish-white to steel-grey in color, with a greyish-black streak. In composition it is a sulpharsenide of cobalt,  $\text{CoAsS}$ . A little iron is present, and a large amount in the variety ferrocobaltite.

Absolite, or earthy cobalt, is an amorphous, earthy or compact substance of dull black color. It is a variety of wad, or hydrous oxide of manganese, containing a variable percentage of cobalt.

Erythrite, often called cobalt bloom, crystallises in the monoclinic system. The crystals are prismatic and vertically striated; they often form radiating tufts or stellate groups. More often the mineral occurs as an earthy incrustation on smaltite. There is a perfect pinacoidal cleavage. The mineral is sectile, has a hardness of 1.5 to 2.5, and a specific gravity of 2.95. It is transparent to subtranslucent, and pearly to dull in lustre. The color is peach-red or crimson, occasionally greyish, and the streak a little paler. Erythrite is a hydrous cobalt arsenate,  $\text{Co}_3\text{As}_2\text{O}_8\cdot\text{H}_2\text{O}$ . Nickel, iron and calcium are sometimes present. This is the usual alteration product of arsenical cobalt minerals, and on account of its striking color forms a useful "cobalt indicator."

The cobalt minerals may be recognized by the deep blue color they impart to borax and microcosmic salt beads.

### Occurrence of Cobalt in America.

Canada: The Cobalt District.—Cobalt lake and town are situated 4 or 5 miles west of the northern end of Lake Temiskaming, which forms part of the eastern boundary of Ontario. The orebodies were discovered during the building of the Temiskaming and Northern Ontario Railway in 1903, and production began in the following year. The output steadily increased rapidly and the production of the Cobalt mines is now the chief source of the world's cobalt.

The ores mined at Cobalt, are exceptionally rich silver ores, and cobalt, nickel and arsenic are merely by-products. One shipment of ore contained 7,402 oz. of silver to the ton, and several exceeded 6,000 oz. to the ton. A typical high-grade ore is said to contain 10 per cent. silver, 9 per cent. cobalt, 6 per cent. nickel, and 39 per cent. arsenic. Although the cobalt is a by-product for which the mine-owners receive little return, these ores have displaced almost all others in supplying the world with cobalt. Indeed, sufficient ore was produced at Cobalt, prior to the outbreak of war, to provide 1,500 tons or more of cobalt oxide annually, while the world's consumption was estimated at only 300 tons per annum.

Cobalt is obtained from these ores in the form of cobalt oxide and cobaltic material containing nickel and a little silver, in smelteries at Deloro and Thorold, Ontario. Metallic cobalt also is now being produced at these localities. A considerable amount of ore is sent out of Canada. The extraction is a complicated wet process, and yields cobalt oxide,  $\text{Co}_3\text{O}_4$ , in the form of a black powder. A bounty of six cents per lb. of metallic cobalt is paid on cobalt and cobalt oxide produced in Ontario; this bounty was to expire on April 10, 1917, but has now been extended for a further period of five years.

Other Canadian Occurrences.—In addition to the numerous veins in the immediate vicinity of Cobalt, similar cobalt-silver veins occur, at considerable dis-

\*Extracts From an Article Published by the Imperial Institute.



tances from the town. They are worked in Casey township, 15 miles to the north; and at South Lorrain, 15 miles to the south-east and near Gowganda and Elk Lake, on the Montreal River, 40 to 60 miles to the north-west of Cobalt. Small shipments have been made from Maple Mountain, 30 miles west of Cobalt. The Lake Superior silver deposits contain cobalt, nickel and arsenic in smaller amounts than those of Cobalt. Cobalt is present in the nickel and copper deposits of Sub-bury.

United States.—A small amount of cobalt was formerly recovered from the Sudbury nickel ores smelted in the United States, but in the present method of smelting the cobalt is slagged out of the matte. From the lead ores of Mine La Motte and Fredericktown, Missouri, cobalt was at one time recovered, the metal being present as linnaeite in association with galena and calcite. At Marion, Kentucky, cobalt and nickel minerals occur in the fluorite deposits. Grant County, Oregon, is said to have produced small amounts of ore containing cobalt, gold and copper. Smaltite occurs in a calcite vein in granite at Gothic in Colorado. Near Blackbird, Lemhi County, Idaho, lenticular bodies of cobalt nickel ore occur in pre-Cambrian schists and quartzites cut by diabase and lamprophyre dykes. In Los Angeles county, California, cobalt-silver ores are found in barytic lodes.

Argentina.—A cobalt deposit, occurring in veins in a talcose schist near its contact with an acid igneous rock, has been worked at Valla Hermosa, Vinchina, Provincia de la Rioja.

Chile.—At the Blanca Mine, near San Juan, in the Department of Freirina, Province of Atacama, cobaltite is associated with tourmaline, apparently deposited at the same period, and accompanied by later quartz and erythrite. The country rock is schist. Smaltite occurs in small quantities in the silver mines of Tres Puntas and elsewhere.

Mexico.—Cobaltite, smaltite, and erythrite are found at Pihuamo Jalisco, in veinlets cutting a large vein of magnetite (oxide of iron), associated with pyrite and pyrrhotite. These ores were formerly mined. Cobalt minerals also occur at Iturbide in Chihuahua, Guanacavi in Durango, Cocala in Sinaloa, and at the Mirador mine in Jalisco. At Boleo, Lower California, the zinc in smithsonite (carbonate of zinc) is said to be partly replaced by cobalt.

Peru.—Nickel and cobalt minerals are reported in the Department of Cuzco.

#### Occurrence of Cobalt Ores in Europe.

Austria-Hungary.—At Joachimsthal, in Bohemia, the veins cut a series of mica-schists, calc-schists and limestones, and are themselves cut by dykes of basalt. The veins are narrow and contain quartz, hornstone, calcite, and dolomite as gangue. The ore minerals may be divided into: (1) Silver ores (native silver, argentite, polybasite, stephanite, tetrahedrite, proustite, pyrrargyrite, stannite, argentic pyrite, rittingerite, acanthite and cerargyrite); (2) Nickel ores (niccolite, chloanthite and millerite); (3) Cobalt ores (smaltite, bismuth-cobalt-pyrite and asbolite); (4) Bismuth ores (native bismuth, bismuthinite, bismutite and bismite); (5) Arsenic ores (native arsenic and arsenopyrite); (6) Uranium ores (pitchblende). Galena, zinc blende, pyrite, marcasite, chalcopyrite and bornite (sulphide of copper and iron) are occasionally present in small amount. The general conditions are similar to those prevailing at Schneeberg and Annaberg on the Saxon side of the Erzgebirge. The silver ores were mined first,

and as early as 1518 the first "Joachimsthaler" were minted. This silver coin is now known as the "thaler," from which the word "dollar" is derived. After 1545 mining declined, but acquired new vigor when the cobalt and bismuth ores became valuable. The industry again languished, but received a fresh impetus with the demand for uranium and radium.

At Doboschau, in Hungary, Palaeozoic slates are intruded by a sheet of diorite, which follows the contact with a stock of garnetiferous serpentine. The veins consist chiefly of siderite (carbonate of iron), calcite, ankerite (carbonate of calcium, magnesium and iron), and some quartz, with tourmaline in a few cases. The ore bodies are irregularly scattered through the veins, and consist largely of a compact mixture of smaltite and rammelsberbite (arsenide of nickel). Copper ores, arsenopyrite and niccolite are sometimes present. The veins broaden upwards into trumpet-shaped expansions of coarsely crystalline siderite as much as 100 ft. thick, containing scattered nests of the copper and nickel ores.

In Styria cobalt and nickel ores are found in lodes traversing pyritic "fahlbands" in hornblende slates and gneiss.

France.—Narrow veins containing silver, cobalt and nickel ores occur in crystalline schist at Chalanches, in Dauphine, France. They were discovered in 1767, and for long were worked only for their silver contents. The richness of the ore and its ready fusibility led to systematic robbery of the mines. Later, the slags and speiss containing nickel and cobalt were recognised as being valuable, and the arsenide ores of these metals were exported to England and Germany. An attempt to manufacture cobalt pigment at Allemont was unsuccessful.

Quartzose veins containing ferriferous smaltite were prospected in 1784, at Juzet, near Montaban-de-Luchon, Haute-Garonne. The ores produced, together with those from Gistain on the Spanish side of the Pyrenees, were treated at Saint-Mamet.

Germany.—At Schneeberg in Saxony veins containing cobalt, nickel, bismuth and silver occur in contact-metamorphosed clay-slates, and tend to become impoverished in the underlying granite. The primary gangue minerals are calcite, ankerite, barite and fluorite; but these minerals are now largely replaced by fine-grained quartz. The ore minerals are smaltite, chloanthite, niccolite, bismutite and native bismuth, native silver and silver ores, and uraninite (pitchblende). As at Cobalt, the cobalt and nickel minerals were deposited first and the silver minerals later. The uranium ores are intermediate in age. The rich silver ores were first mined in the latter part of the fifteenth century, and the invention (or re-invention) of smalt blue soon afterwards led to the exploitation of the cobalt veins. The color industry rapidly developed in Saxony, and color works, using Schneeberg ore, were also erected in Holland and elsewhere. It is estimated that the total production of pigment by the end of the eighteenth century was from four to five thousand tons per annum, representing three or four hundred tons of cobalt, which is greater than the world's consumption in recent years.

At Annaberg in Saxony, veins of similar composition to those of Schneeberg occur in gneiss with dykes of granitic and lamprophyric character. They are younger than the veins in the same region carrying cassiterite (oxide of tin) and those yielding pyritic ores with galena, but are cut by basalts. Chloride of silver is remarkably abundant in the veins.



A similar association of ores is found in several other localities in the Erzgebirge, as well as at Wittichen and at Wolfach, in the Black Forest, where the veins occur in granite.

In Thuringia fault fissures in the Kupferschiefer and Zechstein are filled with barite, calcite and fragments of the country rock, together with smaltite, absolute and erythrite. They have been worked especially at Schweina, near Liebenstein.

The palaeopiebite of Dillenburg (Nassau) contains cobalt, together with nickel, copper and bismuth. At Querbach and Giehren, in the Riesengebirge, the mica-schist near the contact with gneiss is impregnated with cobaltite, chalcopyrite, pyrite, pyrrhotite, arsenopyrite blende, galena, magnetite and cassiterite.

In the Fichtelgebirge ores of cobalt and nickel are associated with siderite, bismuth and barite. Siderite and copper ores are their associates in the Siegen district, Prussia.

In Alsace veins of smaltite, chloanthite and native silver in a calcite gangue were formerly worked at Sainte-Marie-aux-Mines.

Italy.—Cobalt and nickel ores occur in Piedmont with quartz, calcite and ores of copper.

Norway.—At Skutterud and Snarum, near Modum, in Southern Norway, the rocks are highly metamorphosed slates, schists, gneisses, amphibolites and quartzites. They are traversed by "fahlbands" impregnated with pyrite; these at a few points contained cobaltite in workable quantity, and the ore was mined here as far back as 1772.

Russia.—The Dashkessan cobalt deposits are on the east side of the Katschkar-Tschai Valley, about six miles west of Elisabethpol, south of the main range of the Caucasus. The ore minerals, mainly cobaltite, accompanied by chalcopyrite and a little zinc blende, haematite and magnetite, occur very irregularly in a sheet of serpentinised rock lying between magnetic iron ore and a decomposed porphyry. The mines have been worked by a German firm and the product sent to Saxony.

Spain.—Several mines were worked in the eighteenth century, and reopened for a time in 1872, in the valley of Gistain, Huesca, near the French frontier. The chief mineral is a compact ferri-ferrous smaltite, accompanied by niccolite, chloanthite, bismuth and bismuthinite. The gangue is calcite, and the veins occur at the contact of schists and Palaeozoic limestones.

At Guadalcanal, in Andalusia, veins containing ores of silver, cobalt, and sometimes copper, in a calcite gangue, were at one time of importance.

Sweden.—Cobaltiferous "fahlbands" similar to those in Norway were once worked at Vena, near Askersund, on Lake Wetter, but the cobalt content is lower than in the Norwegian occurrences. At Tunaberg, in Södermannland, cobaltite and chalcopyrite occur as grains scattered through crystalline dolomitic limestone. At Gladhammar, south of Westerwik, cobaltite, pyrite and chalcopyrite occur in irregular deposits in leptynites.

Switzerland.—Cobalt and nickel ores occur in Valais, as at Ayer in the Val d'Anniviers and at Kaltenberg in Turtmanntal. They accompany ores of copper and lead.

United Kingdom.—Small quantities of asbolite containing both nickel and cobalt were raised at Model Hiraddug, near Rhyl, in Flintshire, between 1873 and 1890. The total output for the period was 1,264 tons, valued at £6,784. The asbolite occurs in masses up to the size of an egg in red clay, which fills "swallow holes" in the Carboniferous limestone.

Cobalt minerals occur in small amounts at Alderley Edge in Cheshire, in several of the Cornish mines, and elsewhere.

#### Occurrence of Cobalt Ores in Asia.

India.—A Cobalt mineral, described as a simple cobalt sulphide under the name of jaipurite, has long been raised at the copper mines of Khetri and elsewhere, in Jaipur State, Rajputana. It appears, however, to be really cobaltite. It is used in making blue enamel and blue glass bangles, and is said to produce a rose color on gold.

Earthy cobalt, with manganese, is reported to have been found near Henzai in Tenasserim, Burma, and elsewhere.

Linnaeite has recently been identified among some copper ores from Sikkim.

#### Cobalt Ores in Africa.

Belgian Congo.—The crude copper produced by the Union Minière du Haut Katanga, of which 8,064 tons was produced and shipped to Germany in 1913, contained from 2.8 to 3.25 per cent. of cobalt. This formed a by-product easily saved in electrolytic refining, and is said to have been the chief source of German cobalt in recent years.

Transvaal.—At Balmoral, east of Pretoria, the schists of the Cape formation are traversed by veins composed of hornstone with actinolite (silicate of magnesium, calcium, and iron), smaltite and erythrite.

Smaltite sometimes occurs in the auriferous quartz veins, as in the Middleburg district. One vein in the Lydenburg shales is filled almost wholly with smaltite, and contains 7 or 8 per cent. of cobalt, or 0.5 to 1 per cent. of nickel, and 60 to 150 grains of gold per ton. Another vein has a gangue of auriferous quartz mixed with kaolin, with bunches of smaltite, copper ores and sometimes molybdenite (sulphide of molybdenum). The ore carries 100 to 250 grains of gold per ton, 90 per cent. of which is contained in the chalcopyrite.

#### Cobalt Ores in Australasia.

New Caledonia.—This island was the chief producer of cobalt ores at the time the deposits at Cobalt were discovered, but the industry was practically killed by the fall in prices which followed the Canadian production. The ore is absolute, and usually occurs in the form of bluish-black nodules in ferruginous clay. Like the New Caledonian nickel ore, it is the result of the decomposition of peridotite. Cobalt oxide averages from 4 to 6 per cent. of the ore.

New South Wales.—The second largest producer of cobalt in the world, before the discovery of the Canadian deposits, was New South Wales. Here the chief deposits are situated near Port Macquarie, and are similar in character to those of New Caledonia. Asbolite was also worked near Bungonia, and glaucodote near Carcoar.

South Australia.—Cobalt ore, containing smaltite and other minerals, is found at Bimbowrie, near Olary, on the Broken Hill line, but little work has been done on the deposit.

#### Cobalt Compounds and Their Uses.

The cobalt compounds, and especially the pigments, were for centuries the only form in which cobalt was employed.

Smalt (bleu d'azur, bleu de Saxe), the manufacture of which in Saxony dates from the sixteenth century, is a blue glass, essentially a silicate of potash and cobalt, and usually contains about 6 per cent. of cobalt. For its preparation the cobalt ore, consisting of smaltite with a little bismuth in the case of the Saxon industry,



was first gently heated to melt out the bismuth, and was then stamped and roasted in reverberatory furnaces. The resulting crude cobalt oxide, known as zaffre, safflor, or safflower, was mixed with potassium carbonate and white quartz and fused in a glass furnace. A little arsenic, obtained as a sublimate in roasting the ores, was added to the mixture; it combined with the deleterious metals present in the ore, such as iron, copper and nickel, and caused them to settle to the bottom of the melting pot. The fused cobalt glass was dipped out with iron spoons and poured into cold water, giving a friable glass which was afterwards ground to powder, levigated, dried and sifted. Modern methods of manufacture are essentially the same as that described above. The name eschel is sometimes given to a fine-grained and light colored grade of smalt.

Cobalt blue (Thenard's blue, cobalt ultramarine, king's blue) is essentially a compound of cobalt oxide and alumina; phosphoric acid and zinc oxide are often added, the latter changing the tint from a slightly reddish to a greenish blue. This pigment is usually obtained by calcining a mixture of alum and cobalt sulphate, either alone or with zinc sulphate.

Cerulean blue (bleu celeste), obtained by heating together cobalt sulphate, tin oxide and precipitated silica or chalk, is a light-blue artists' color.

Cobalt green (Rinmann's green, or zinc green) is a compound of zinc oxide and cobalt oxide analogous to cobalt blue. It is a bright green color with a slightly yellow tinge.

Turquoise green, a bluish-green color, used chiefly in porcelain painting, is usually made by heating to redness a mixture of aluminium hydroxide, chromium hydroxide and cobalt carbonate.

Indian yellow (aureolin, cobalt yellow) is an artists' color, prepared by treating an acetified solution of cobalt nitrate with a solution of potassium nitrite, the precipitate being washed, filtered, pressed and dried.

Cobalt brown is formed by calcining a mixture of ammonium sulphate, cobalt sulphate and ferrous sulphate.

Red and pink cobalt compounds are of scientific rather than technical interest. If cobalt arsenate is strongly heated and then ground it yields a pinkish-red powder. The precipitate obtained from a solution of a cobalt salt with sodium phosphate is pink, changing to violet when heated. Cobalt magnesia pink is obtained from precipitated magnesium carbonate, mixed to a thin paste with cobalt nitrate solution, then dried and heated in crucibles.

Cobalt bronze is a phosphate of cobalt and ammonia, of a violet color with a bronze-like metallic lustre.

Although most of the cobalt colors mentioned above have considerable permanence, their high price and generally poor covering power as compared with other pigments of similar tint prevent their extensive use, and most of them have only a limited application as artists' colors. In the glass and pottery industries, however, cobalt is the only blue coloring matter employed, with the exception of the turquoise blue given by oxide of copper, and these industries are the chief consumers of cobalt compounds. The oxide is generally used, but also the carbonate, silicate and phosphate; added alone to a glaze, they give a beautiful deep blue, which is slightly violet; with alumina a sky-blue color is produced, while the addition of oxide of zinc gives an ultramarine tint. A small percentage of cobalt oxide or a cobalt solution, is sometimes added to the

body in order to counteract the yellow color due to the presence of iron, and gives a pure white ware.

Organic compounds of cobalt, such as the resinate, oleate, linoleate and tungate have been used as driers of oils, especially of fish oil and other cheap oils used as substitutes for linseed oil in paint. It is stated that the linoleate or resinate of cobalt and lead acts better than the single cobalt salt.

Cobalt nitrate is employed in the blowpipe examination of minerals. When moistened with this reagent and strongly heated, alumina gives a blue color, magnesia a pink, zinc oxide green, and zinc silicate blue, owing to the formation of some of the cobalt pigments described above.

Sympathetic inks.—Many of the soluble salts of cobalt are pink and deliquescent. If a weak aqueous solution of one of them, such as the nitrate or chloride, is used as ink, the writing is practically invisible, but if the paper is held near the fire the combined water is driven off and the writing becomes blue and visible. It will afterwards absorb water from the atmosphere and again disappear.

#### Uses of Metallic Cobalt and Its Alloys.

The great production of cobalt-silver ores in Ontario has led the Dominion Department of Mines to endeavor to find fresh applications for cobalt, with a view to increasing the consumption. Accordingly, a series of researches on cobalt and its alloys was undertaken for the Mines Branch of the Department of Mines by H. T. Kalmus at Queen's University, Kingston, Ontario. The investigations include: I. The preparation of metallic cobalt by reduction of the oxide; II. A study of the physical properties of the metal cobalt; III. Electroplating with cobalt and its alloys; IV. Cobalt alloys of extreme hardness; V. Cobalt alloys with non-corrosive properties; VI. The magnetic properties of cobalt and of the alloy Fe-Co. The results of the first three of these investigations were published by the Mines Branch.

The preparation of cobalt from the oxide  $\text{Co}_2\text{O}_3$  was successfully performed by Dr. Kalmus in four ways, using carbon, hydrogen, carbon monoxide and aluminium respectively as reducing agents. The first of these is the usual commercial method. Using powdered anthracite intimately mixed with the cobalt oxide, he found that practically complete reduction can be obtained in one hour or less at a temperature of about 1200 degrees C. Powdered charcoal or lampblack gives better reduction, and the temperature may be as low as 900 degrees C. Briquetting the charges with an organic binder tends to increase the rate of reduction at all temperatures, and yields the metal in a form that can be easily handled without previous fusion. The final product need not contain more than 0.20 per cent. of carbon. Small amounts of very pure cobalt may be obtained by heating in a current of hydrogen or carbon monoxide. The reduction takes place very rapidly at all temperatures above 500 degrees C. in the first case and 600 degrees C. in the second. Complete reduction is obtained in a few minutes at temperatures of 1100 degrees C and 900 degrees C. respectively, and the cooling must be carried out in the reducing atmosphere to avoid re-oxidation. Producer gas may also be employed, and offers a cheap and efficient method of preparing large quantities of pure metallic cobalt. Reduction of cobalt oxide with aluminium powder in an ordinary thermit welding furnace takes place with extreme violence, and gives metallic cobalt containing 0.1 per cent. or less of aluminium and no carbon at all.



In his memoir on the physical properties of cobalt Dr. Kalmus describes the pure metal as resembling nickel in color, although it possesses a slightly bluish cast. Metallic cobalt that has been reduced from its oxide at a sufficiently low temperature is a grey powder. The specific gravity of cobalt is 8.7918 at 17 degrees C. when cast and unannealed, 8.9253 when swaged. The hardness of cobalt, cast from just above its melting point, is 124 on the Brinell scale, which is considerably higher than that of cast iron or cast nickel. The metal has a sharply defined melting point at 1467 degrees C. Previous determinations of the melting point gave 1530 degrees C (Copaux) and 1478 degrees C. (U. S. Bureau of Standards). The tensile strength of pure cast cobalt is about 34,400 lb. per square inch, and slightly higher after annealing. The tensile yield point is very near the tensile breaking load. When the metal is rolled its tensile strength increases rapidly, and may reach over 100,000 lb. per square inch in a swaged wire. The presence of 0.06 to 0.3 per cent. of carbon, as in "commercial cobalt," raises the tensile strength from 34,400 to 61,000 lb. or more per square inch. The compressive strength of pure cast cobalt is about 122,000 lb. per square inch, and very slightly less when annealed. The compressive yield-point is 56,100 lb. per square inch when annealed, and 42,200 when unannealed. "Commercial cobalt," with 0.06 to 0.3 per cent. of carbon, has a compressive breaking strength of over 175,000 lb. per square inch.

Pure metallic cobalt may be machined readily in the lathe, although it is somewhat brittle and yields a short chip. The addition of small amounts of carbon renders cobalt less brittle and yields a longer curling chip on turning. "Commercial cobalt," containing small percentages of carbon, may readily be swaged down from cast bars to wires of any desired diameter, but cobalt of extreme purity cannot be rolled or swaged unless first cooled down under pressure, and then rolled at 500 degrees or 600 degrees. The specific electrical resistance of cobalt wires of extreme purity is  $89.64 \times 10^{-7}$  ohms per centimetre cube at 18 degrees C., or about five times that of pure copper. The effect of annealing the wire in vacua is to reduce the specific resistance by about 5 per cent. As little as 0.5 per cent. of impurities may treble the specific resistance, and samples of "commercial cobalt" gave values between  $231 \times 10^{-7}$  and  $103 \times 10^{-7}$  ohms per centimetre cube. Cobalt is magnetic at all temperatures up to about 1100 degrees C. The mean specific heat of cobalt between 15 degrees and 100 degrees C. is 0.1053.

The third memoir by Dr. Kalmus, published by the Mines Branch, deals with electro-plating with cobalt. Of many solutions tried, the best were found to be (1) cobalt-ammonium-sulphate, 200 grams per litre of water; (2) cobalt sulphate, 312 grams, and sodium chloride 19.6 grams per litre, together with nearly sufficient boric acid to saturate the solution. From these solutions cobalt will readily deposit on articles of the various shapes, sizes, and compositions met with in ordinary nickel-plating practice.

The electrical conductivity of these two solutions is considerably higher than that of the standard commercial nickel solutions, so that they may be operated at a lower voltage for a given speed of plating. At higher voltages they are capable of plating at very high speeds, the first solution at four times, and the second at quite fifteen times the speed of the fastest satisfactory nickel solution, without any agitation of the solution. The cobalt plate is firm, adherent, hard and uniform, and may be buffed readily to a brilliant sur-

face. It is deposited well in the indentations of the work, and withstands the bending, hammering and burnishing tests to which nickel plate is ordinarily submitted. It is harder than nickel plate, and consequently a lesser weight of cobalt deposit will afford the same protective coat as a greater weight of nickel. The second solution, for example, will deposit in one minute as satisfactory a plate as the best nickel baths will deposit in one hour, the actual weight of the cobalt deposit being one-fourth that of the nickel. This difference in the weight of metal used more than counteracts the higher price of cobalt compared with nickel, and the extreme rapidity of the process would further reduce the working cost. Not only would a smaller plating room be required for a given amount of work a day with cobalt than with nickel, but mechanical devices for passing the work through the bath become possible, thus reducing the labor cost.

As a steel-alloying element, cobalt has been employed with notable success in high-speed steels. Steels containing about 4 per cent. of cobalt, in addition to tungsten and chromium, make high-speed tools which retain their edge well at or near a red heat, and will cut or turn manganese and nickel-chromium steels successfully.

In the form of a cold saw the cobalt-steel was found to be less satisfactory, its most valuable property being its "red-hardness," which enables the steel to cut at a high speed. Nickel, on the other hand, gives a steel which softens at the edge when hot.

A German steel, somewhat misleadingly called "iridium steel," contains approximately 4.25 per cent. cobalt, 16.00 tungsten, 3.55 chromium, 0.67 vanadium, 0.80 molybdenum, and 0.60 per cent. carbon. It is said to be greatly superior to the best tungsten steels.

Ferrocobalt, containing about 70 per cent. of cobalt, is the usual form in which the cobalt is added to steel. It has recently been proposed, however, to introduce the cobalt in the form of cobalt fluoride, which can be prepared cheaply.

An alloy of cobalt and iron, approximating to  $\text{Fe}_3\text{Co}$ , has been found to possess a magnetic permeability in strong magnetic fields which is about 10 per cent. higher than that of the best Swedish soft iron. This was discovered independently by P. Weiss at Zurich and by H. T. Kalmus at Kingston, Ontario.

Small percentages of cobalt added to pure iron give alloys which resist corrosion and are suitable for roofing.

Alloys of cobalt and chromium, on account of their hardness and resistance to acids, are much used in "stainless" cutlery. The original stellite is one of these alloys, containing about 75 per cent. of cobalt and 25 per cent. of chromium; table knives made from it may be used in vinegar and acid fruit juices without tarnishing or appreciable loss of lustre or sharpness.

By the addition of molybdenum and tungsten the stellite alloys are made very hard. In some experiments by E. Haynes, with the chromium maintained at 15 per cent., it was found that the alloy gradually increased in hardness with the percentage of tungsten. When the quantity of tungsten is 5 per cent., the alloy is distinctly harder, particularly when forged under the hammer. When the tungsten reaches 10 per cent. the metal still forges readily, and a tool formed from it takes a fine cutting edge. This alloy is suitable both for cold chisels and for wood-working tools. When the tungsten rises to 15 per cent. the metal can still be forged, but great care is necessary to avoid checking. This alloy is considerably harder than that containing



10 per cent. tungsten, and is excellent for cold chisels. When the tungsten rises to 20 per cent. the alloy is still harder and can be forged to a small extent. With 25 per cent. of tungsten a very hard alloy is formed, which cannot be forged, but casts readily into bars which can be ground to a suitable form for lathe tools. These tools are highly efficient, particularly in the turning of steel, since they are very strong, and retain their hardness at high speeds. The tungsten may be increased to 40 per cent., giving an alloy that will readily scratch quartz.

When molybdenum is added to a cobalt-chromium alloy containing 15 per cent. of chromium, the hardness rapidly increases with the molybdenum content, until the latter reaches 40 per cent., when the alloy becomes extremely hard and brittle, scratching quartz with ease. With 45 per cent. of molybdenum the metal takes a strong, keen edge, has a beautiful lustre, and is very suitable for fine, hard cutlery. If carbon, boron or silicon is added to any of the above alloys a harder, but more brittle, metal is obtained.

Similar additions of tungsten or molybdenum, or both, to a cobalt-chromium alloy containing 25 per cent. of chromium gave equally satisfactory results.

Another cobalt-chromium alloy, cochrome, may be swaged into wires which are in some respects superior to nichrome wires in electric heating elements. They are less readily oxidised at high temperatures, and have a higher melting point.

A French patent (No. 460,093, July 7, 1913) covers the preparation of cobalt filaments for incandescent electric lamps. The filament is made from a solution of cellulose with zinc chloride, cobalt oxide and manganese sulphate; it is heated to incandescence for twenty hours and then coated with carbon.

An alloy containing 40 per cent. of cobalt and 60 per cent. of tin is extremely acid-proof, even to aqua regia, but is too brittle for practical use. If from 5 to 20 per cent. of this alloy is added to molten copper, a product is obtained which can be machined and still retains a high degree of non-corrodibility.

The addition of 0.25 and 0.5 per cent. of cobalt to a brass containing 80 per cent. of copper and 20 per cent. of zinc was found to increase the tensile strength by 15 and 20 per cent. respectively.

Light alloys of aluminium and cobalt usually contain from 9 to 12 per cent. of cobalt. The structure of these alloys is coarsely crystalline, and the tensile strength is little more than that of pure aluminium. The addition of 0.8 to 1.2 per cent. of tungsten, however, renders the structure fine, and increases the strength to two or three times that of aluminium. Such alloys have a specific gravity between 2.8 and 2.9; they work and polish well, and are very stable in air. Molybdenum has the same effect as tungsten.

An amalgam of cobalt with mercury is used in dentistry.

### THE CARBIC LIGHT.

Carbide is now largely used for underground lights and compared with most systems of lighting has many advantages. Among the disadvantages are (1) liability to overheating and (2) generation of undesirable gases. To overcome these defects the Carbic light has been devised and is now in use in many mines.

The carbide light is an excellent light for use by individual miners, but the system of generating the gas as used in these lamps is too dangerous for powerful lights. In the Carbic light the carbide is used in the form of cakes which have been chemically treated

and compressed. They are said to be easily handled and perfectly safe and will not deteriorate if left in the open air for a length of time.

The Carbic cake gives a pure white, smokeless light, leaving the air pure to breathe. It can be used until every particle is consumed in the burning of the light, therefore there is absolutely no waste. The light is so constructed that over-generation is eliminated. The gas is generated as required, and when the burner is shut off the generation of gas ceases in the generating chamber.

The light is equipped with a patent burner, which is self-cleaning, adjustable to any candle power up to 2,000, made of solid hard brass and guaranteed to last indefinitely. In mechanical construction, complicated parts are avoided, thereby relieving the operator of any chance of costly blunders. It does not require a smooth surface for the light to stand on. The light is so constructed that it will stand on lumps of earth or rock and still be in an upright position.

### BUY A CERTIFICATE.

The new War Savings Certificates which have been created by the Government to encourage thrift and economy and to give everyone an opportunity to assist in financing our war expenditure, are now on sale at every bank and money order post office in Canada. The \$25 certificate sells for \$21.50, the \$50 for \$43, and the \$100 for \$86.

As an investment these certificates offer many attractive features—chief of which are the absolute security and the excellent interest return. For every \$21.50 lent to the Government now, \$25 will be returned at the end of three years.

There are two other features which are especially interesting to small investors. First, the certificates may be surrendered at any time, if the buyer should need his money; and second, each certificate is registered at Ottawa in the buyer's name and, if lost or stolen, is therefore valueless to anyone else.

But while they are excellent from an investment standpoint, the certificates should appeal strongly to Canadians because they offer to those who must serve at home a splendid opportunity for a most important patriotic service. The person who honestly saves to the extent of his ability and places his savings at the disposal of the Government by purchasing these certificates, may feel that he is having a direct share in feeding, equipping, and munitioning our Canadian soldiers, who are so nobly doing their part.

The Coast Copper Co., organized to acquire and operate a group of mineral claims situated in Quatsino mining division, Vancouver island, is reported from Trail, where the company has its head office, to be employing about 40 men in connection with the development of its copper property, which includes the Merry Widow and Old Sport groups, already partly developed by men connected with the Stewart Mining Co., of the Coeur d'Alene district of Idaho.

A report of progress at the Highland Mining and Development Co's mine and recently completed concentrator, in Ashcroft mining division, made several weeks ago by the president and manager of the company, Mr. Frederic Keffer, gives the information that five carloads of concentrate had been produced, and that a flotation concentration plant put in would soon be ready for operation. Three raises had been made from one of the adits to the surface and a fourth is being made.



# MINING OF ANTIMONY ORES IN CANADA\*

By A. W. G. Wilson.

The principal source of the antimony obtained in Canada is the mineral stibnite, with which, in some localities, is associated native antimony. Pure stibnite contains 71.4 per cent. metallic antimony, and 28.6 per cent. sulphur. In past years metallic antimony has been recovered as a by-product from the lead refinery at Trail, being derived from antimonial lead ores of southern British Columbia.

Antimony ores, as mined in Canada, contain from 1 per cent. to 20 per cent. metallic antimony; but occasionally, small lots are secured in which the metallic content is greater. Native antimony has been reported from six Canadian localities, and stibnite from seventeen, of which eight are in British Columbia. It is probable that a revision of the list will include many additional localities, especially in British Columbia.

At the present time there are only five places, so far as I can ascertain at the date of writing, where mining has been carried on purposely to recover antimony ores. In two of these the product is auriferous or argentiferous, and is of value not only for the antimony, but also for the precious metal content. These localities are: West Gore, Hants County, Nova Scotia; Lake George, Prince William Parish, York County, New Brunswick; lot 56, range I, Township of South Ham, Wolfe County, Quebec; Bridge River District, British Columbia; and Wheaton River District, Yukon.

Antimonial lead ores have been produced from a number of mines in the Kootenay district of British Columbia. Similar ores are also reported from northern British Columbia, in the district of which Hazelton is the business centre. No antimony is being recovered from these ores at the present time.

## West Gore, Nova Scotia.

The mine at West Gore, Nova Scotia, now belongs to the West Gore Antimony Company, the principal stockholders of this company being closely associated with the ownership of the St. Helen's Smelting Company, of Manchester, England.

The first discovery of antimony ore in this locality was made during some road building operations many years ago. The first mining was done in 1884, the property being then known as the Rawdon mine. Operations were continued for a number of years, the production gradually diminishing until 1891 when it stopped altogether. The mine was re-opened in the autumn of 1898 and operated for a short time, closing again in the spring of 1900.

It was again re-opened in January, 1903, a new plant was installed, and mining operations and development was carried on vigorously for a number of years. In 1907 a concentrating mill with a capacity of 100 tons of ore per day was erected, but appears to have been operated only a short time. The mine was closed down early in 1908 owing to litigation.

The present owners of the West Gore property came into possession about six years ago, but operations were not resumed until October, 1914. Ore shipments were resumed in December, and since that date have been gradually increasing. The present rate of output is about 1,200 tons of ore per month, which is treated in the concentrating mill, the shipments being in the neighborhood of 110 tons per month of concentrates

containing from 38 per cent. to 45 per cent. antimony. All concentrates are shipped to the St. Helen's smelter, Manchester, England.

These deposits occur within the Gold Bearing Series of Nova Scotia. The rock immediately associated with the ore bodies is a dark colored, soft, somewhat fissile slate. The ore bodies occur as fissure veins containing stibnite, native antimony, a little pyrite, and occasionally small coatings of the oxides of antimony, kermesite and valentinite with a little associated quartz and calcite. Three veins have been discovered in the locality. The most northern one—called the Messervey and McDougall property in the report of the Nova Scotia Department of Mines, 1899,—was worked only for a short time. The vein is stated to have averaged probably about 5 inches in width and to have shown considerable antimony associated with quartz and calcite. A shaft was sunk for a depth of 55 feet, following the vein which dips to the south at an angle of about 72 degrees.

The principal vein of the district, the one which has produced most of the ore, and on which work is now in progress, lies about 800 feet south of this. The general strike of the vein is about N. 46 deg. W. magnetic, and the dip towards the southeast is about 72 deg.

A third vein, apparently that referred to in the report for 1899 as the "Northup" lead, occurs about 1,200 feet farther southwest. In later reports this vein is known as the Brook vein. An exploratory shaft was started prior to 1899 and a small amount of ore was secured from a vein about 4 inches in width. This shaft was subsequently re-opened in 1907, and a little more work done, but there does not appear to have been any large recovery of ore from this vein.

The principal vein was first opened up by two shafts in 1884, and most of the ore recovered during the first period of operation of the mine appears to have been removed through these shafts. The depth of these shafts was about 175 feet. The ore body is reported to have varied between 4 in. and 18 in. in width.

When the mine was re-opened in 1903 a third shaft was started. In 1903, No. 1, the most eastern shaft, had a depth of 430 feet. No. 2, the middle shaft, was located about 160 feet west of No. 1, and had a depth of 240 feet. No. 3, located 112 feet west of No. 2, had a depth of 180 feet. The period of greatest development of the mine appears to have been between the years 1903 and 1908. The development at the end of September, 1907, is shown in the following table:

| No of Level | Depth in feet | Present length in feet. |      |
|-------------|---------------|-------------------------|------|
|             |               | East                    | West |
| 1           | 113           | 122                     | 160  |
| 2           | 228           | 44                      | 160  |
| 3           | 318           | 182                     | 432  |
| 4           | 410           | 342                     | 763  |
| 5           | 492           | 290                     | 179  |
| 6           | 586           | 18                      | 269  |
| 7           | 662           | 57                      | 447  |
| 8           | 769           | 124                     | 200  |
| Shaft       | 502           |                         |      |
| Winze       | 332           |                         |      |

Levels Numbers 6, 7, and 8 are reached from the winze which lies 257 feet east of the shaft. The shaft

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now in use is vertical for the first 200 feet, and then slopes to the south at an angle of about 70 deg., following the inclination of the vein.

As previously noted the mine was closed down early in 1908 and little additional development work can have been done. Since it was re-opened in December, 1914, a certain amount of new development work has been under way, but the principal work has been the recovery of ore already developed. At the present time active mining is going on at a number of points on the four lower levels, and a small amount of ore is also being recovered from some of the old workings on the third level.

The main ore body varies in width from a minimum of almost nothing to a maximum width of about four feet. The greatest extent of any single ore vein along any one level appears to have been about 200 feet, though small veins of ore, presumably offshoots from the main vein, have been encountered on several levels. The depth to which the main ore shoot extends has not been determined. It has been found to pitch towards the east at an angle of approximately 50 degrees.

The ore, as mined, consists of stibnite and native antimony, associated with a little pyrite, quartz, calcite, and fragments of the country rock.

At the present time ore mined below the fifth level has to be raised in the winze east of the shaft and trammed up by hand to the main shaft. All the hoisting is done through this shaft in a skip of about one ton capacity.

The ore is delivered to a small bin near the top of the head frame, from which it is loaded into a car and trammed by hand across a trestle to the mill, which is located about 200 feet north of the main shaft-house.

The boiler room at the shaft house is equipped with three boilers, a 200 horse-power Barrow Combination, a 100 horse-power Babcock Wilcox, and a 50 horse-power Matheson. The first is used on the compressor, the third on the hoist, and the second is held in reserve. There are two compressors, a small 5 drill straight line Rand, and a Blaisdale duplex steam, compound air with a capacity of about 1,250 cubic feet per minute. The hoist is a Lidgerwood, 10 by 12 capable of hoisting from a depth of 1,100 feet.

The mill was designed and constructed by Mr. D. F. Haley, and was erected in 1907. A fairly complete description was published by the Nova Scotia Department of Mines in 1907, and a full description of the equipment and a flow sheet of the mill is given in that report. The present flow sheet is only slightly different from the original flow sheet as given in the publication quoted above. In general it may be stated that water concentration is used. The oversize ore is handpicked, and afterwards crushed. The crushed ore and the undersize from the first screening are successively crushed, sized, and concentrated in a series of jigs followed by Wilfley tables and Frue vanners. The mill is equipped with four jigs, five Wilfley tables, and three Frue vanners. Power is supplied by a 150 horse-power return tubular boiler, Truro Foundry Company, supplying steam to a 135 horse-power Wheelock engine, cylinder 15 in. by 34 in. The main water supply is obtained from an artificial pond formed by a dam thrown across the hollow of the creek bed in which the Brook shaft was located, some 1,200 feet west of the mill. It is pumped from this point to a

500,000 gallon water tank located about 400 feet south of the mill. Additional water is to be secured by another dam located north of the mill on another small creek. The principal machines employed in the mill are a Farrel rock-crusher, 10 in. by 16 in., two Dodge crushers, 8 in. by 10 in. and 4 in. by 6 in. respectively, a Huntingdon mill, 5 ft. diam., a set of rolls, 20 in. by 15 in., and two elevators, one 60 ft. and one 40 ft. in length. The shipping products are hand-picked lump ore, Jig concentrates, Wilfley concentrates, and Frue slimes.

The ore is packed in barrels and shipped to the St. Helen's smelter, Manchester, England, belonging to the principal owners of the mine.

According to the returns published by the Nova Scotia Department of Mines the output of the mine is in the neighborhood of 1,200 tons of ore per month. This ore is concentrated in about the ratio of ten tons of ore for each ton of concentrates. The concentrates as shipped contain on the average, about 40 per cent. of metallic antimony, or perhaps a little more. It is stated that the ore also contains about one dollar's worth of gold for each per cent. of antimony in the original ore. The shipment of 1,403 tons of ore in 1907 is reported to have contained 1,319 ounces of gold. In 1906 the shipments of 782.5 tons of ore, hand-picked, yielded 1,031.6 ounces of gold. It is to be presumed that the present yield is at about the same rate. The yield per ton of concentrates shipped will presumably be somewhat higher, as mill concentrates were not included in the 1906 shipments, and appear to have formed only a very small part of the 1907 shipments.

At the present time the output of the mine is limited by two factors, the capacity of the shaft, and the water supply for the mill. At certain seasons of the year the water supply is limited, but it is expected that the new supply to be obtained from the new pond on the creek north of the mill will be sufficient for all requirements.

The country rock is fissile, and in the immediate shattered. On exposure to the wet mine air it exhibits a tendency to slough off. In development it is therefore necessary to timber the drifts.

In mining an overhead stoping system is employed. The ore chutes are located at about 25 ft. centres, and are timbered. The stopes are filled with waste rock obtained in following the vein, which is usually of a less width than the stope. The top of the filling is kept as close to the backs as possible, leaving only room to work. The ore is broken down upon the filling and partially sorted by hand from waste before being thrown down the ore chutes. From the ore chutes it is hand-trammed in ordinary steel mine cars of about one ton capacity to the shaft, where it is hoisted to the surface in a one ton skip.

(To be continued.)

#### USES OF MOLYBDENUM.

The principal use of molybdenum is in the manufacture of alloy steels to which, particularly in conjunction with chromium, manganese, nickel, cobalt, tungsten, and vanadium, it imparts many desirable properties. These steels are used for a large variety of purposes such as for crank-shaft and propeller-shaft forgings, high-pressure boiler plate, guns of large bore, rifle barrels, armor plate, armor-piercing projectiles, permanent magnets, wire, and for self-hardening and high-speed machine tools.



## OBITUARY

W. T. McClurg, who died recently at Sandon, Slocan, B.C., was at one time cashier of the First National Bank, Spokane, Washington. In 1899 he went to Sandon, where he became accountant for the Minnesota Silver Co., which operated the Ivanhoe group of mines in the mountains above Sandon and a concentrating plant placed in the valley just below Sandon. Afterward he occupied a similar position in the office of the Slocan Star Mining Co. Later he was associated with Mr. R. T. Poff of Detroit, and Mr. W. T. Bennett, of Sandon, in operating the Mountain Con mine, also in the Slocan, from which were shipped several cars of silver ore of exceptionally high grade. His age was about 55 years.

A recent victim of pneumonia was Guy Stanley Davys, of Kaslo, B.C., an Associate of the Royal School of Mines, London, England. He had been engaged in assisting his father, Mr. M. S. Davys, formerly manager of the Silver King mine near Nelson, West Kootenay, in operating the magnetic separating and concentrating plant at Kaslo. Prior to Mr. Davys, Sen., undertaking the work of putting the Kaslo works into running order and adding concentrating plant, both father and son had been for several years engaged in concentrating ore from the Hewitt-Lorna Doone silver-zinc mine, near Silverton, Slocan lake, at the mill on Four-mile creek, in Silverton camp where much experimental work in flotation concentration was done. The deceased young man was born in Nelson, B.C., and was only 25 years of age when his untimely death occurred.

## COAL MINING AT NICOLA.

The three coal mines in the neighborhood of Merritt, Nicola Valley, now being operated are busy, and many more miners could be employed in the mines of the Middlesboro and Inland Coal and Coke companies if they could be secured, says the Merritt Herald. Shipment of coal is being increased steadily, and the amount of the monthly payroll is gradually approaching its 1914 total. In January the combined shipments of the three mines were about 15 cars of coal a day, about two-thirds of this quantity going to Boundary and Coast points and one-third to places along the Canadian Pacific Railway main line. The Diamond Vale mine has not yet become a heavy shipper, but good progress is being made with the work of preparing it for production, about 45 men being employed. The pumps are still unwatering the lower levels of the mine, and as soon as these shall be made ready for mining coal it will be possible to increase the output considerably. There are now more men on the mines' payrolls in the neighborhood of Merritt than at any previous time in the last two years. While the output of coal from the Middlesboro and Inland Coal and Coke companies' mines is larger than for many months past, it could easily be doubled if it were possible to obtain sufficient miners to meet present demands.

The Multiplex company has made a small shipment of ore from its property in the neighborhood of Camborne, Lardeau mining division of West Kootenay, to the Consolidated Company's smelting works at Trail, for test purposes. It is stated that more than 100 tons of silver-lead-zinc ore has been hauled down from the Beatrice mine, also near Camborne, for shipment to Trail.

## THE EROSION OF GUNS.

New York. In an effort to increase the efficiency and life of guns constructed for the U. S. Government members of the Naval Consulting Board will, during the next two weeks, meet with the American Institute of Mining Engineers for discussion of an important phase of this subject. The meeting will be in connection with the 114th convention of the Institute to be held in New York during the week of February 19th, and officers of the Army and Navy, Government representatives and other experts will be in attendance.

The special subject to be discussed deals with the erosion of guns, or the hardening of the inner surface of the gun tube, a problem which is at present seriously engaging the attention of many of the country's leading scientists. The discussion will be opened with a paper by Dr. Henry Fay, of the Massachusetts Institute of Technology, which paper was prepared from a series of tests of metals made at the Watertown arsenal, and which is one of the technical papers at the forthcoming convention.

A committee of the Naval Consulting Board, headed by Dr. Hudson Maxim, will be present at the Mining Engineers' session and discuss the subject, after which the committee will hold a meeting with technical experts in the rooms of the American Institute of Mining Engineers.

The entire Naval Consulting Board has been invited to attend the meeting of the institute and in view of the great interest aroused in this subject, it is believed that the coming meeting will run with any in the forty-six years of the Institute's history. About five hundred mining engineers from all parts of the country will attend.—Bradley Stoughton.

Coal Age, New York, recently published the following item: Peace River, Alta.—Two coal mines in this neighborhood are being opened. One of these is situated on the Heart River, about two miles from the town of Peace River. The coal which is reported to be of good grade is expected to be immediately put on the market. The other mine is six miles down the Peace river and the coal is said to be of fine quality.

The Victoria, B.C. Daily Times said on January 17: When the Yukon company left Victoria yesterday, there was lost to the city a magnificent fighting unit, thoroughly trained, well officered, and in every respect a competent band of men. . . . The Yukoners are going to the Princess Patricia's. Their commanding officer is Captain Black, chief official of the Dominion Government at Dawson, Yukon, under whose guidance the men have been recruited and trained. The homes of practically all the men are in the far northern country, and the majority of the men are hardened to the rigors of severe weather.

## A LARGE MASS OF COPPER.

The Quincy Mining Co., has just completed the extraction of a mass of copper that will rival the largest ever secured in the Michigan district. The miners have been working on this mass for three months. It was over 78 feet long and varied in thickness from six inches to two and a half feet. Its width ran from three feet to 10. The mass was first struck at the 70th level of No. 2 shaft and not far from the lode. On the first of the year it was all taken out but ten tons which has since been extracted. The mass was cut into blocks and sent direct to the smelter.



## PERSONAL AND GENERAL

Mr. Frank Oliver is examining mineral deposits in North Carolina for New York interests.

Mr. Geo. R. Rogers is in the West Shiningtree district examining properties.

Mr. Geo. C. Mackenzie will address the Royal Canadian Institute in Toronto on Feb. 17, on mining and metallurgy of Canadian molybdenum ores.

Mr. W. A. Davidson, Mr. Walter F. McNeill and Mr. Norman C. Pitcher will represent Alberta on the Council of the Canadian Mining Institute for the coming year.

Mr. E. E. Campbell, Mr. Thomas Graham and Mr. Gomer P. Jones have been nominated to represent British Columbia on the Council of the Canadian Mining Institute.

Mr. O. T. Bibb is in charge of work on the Multiplex company's property in the neighborhood of Camborne, Lardeau district of British Columbia.

Mr. R. Randolph Bruce, of Wilmer, East Kootenay, left British Columbia for England early in January.

Mr. James Cronin, who has for several years been developing mineral claims situated in the Babine region, Omineca division of British Columbia, was in Victoria last month interviewing the Government relative to improving wagon road conditions so that ore may be hauled from the Babine-Bonanza Mining and Milling Co.'s mine to the Grand Trunk Pacific railway, for shipment thence to a smelter.

Prof. J. C. Gwillim left Nelson, B.C., on his return to Ontario, after having been in British Columbia several months making investigations relative to occurrences of molybdenum and zinc, for the Dominion Government.

Mr. A. B. W. Hodges, of Los Angeles, California, for a number of years local manager in Boundary district of British Columbia, for the Granby Consolidated M. S. and P. Co., was in Victoria last month, on his way north to visit that company's Hidden Creek mine and smelting works at Anyox, Observatory inlet, B.C.

Mr. George Long, for years engaged in mining in Slovan City mining division, has been engaged by Mr. Clarence Cunningham, lessee of the Van-Roi silver lead mine, near Silverton, Slovan, B.C., to superintend mining work recently undertaken on that property.

Mr. Lucius W. Mayor, of New York, president and consulting engineer of the British Columbia Copper Co., and its holding company the Canada Copper Corporation was in the Boundary and Similkameen districts of British Columbia last month looking over the company's mining property and smelting works. He was accompanied from Greenwood, Boundary, to Copper mountain, Similkameen, by Mr. Oscar Lachmund, general manager in British Columbia for both companies.

Mr. J. W. D. Moodie, vice-president and general manager of the Britannia Mining and Smelting Co., returned to Britannia Beach, Vancouver mining division, B.C., late in January from a business trip to New York, the headquarters of the company.

Mr. Thomas Russell, for many years managing coal mines on Vancouver Island, B.C., and latterly superintendent of the Crow's Nest Pass Coal Co.'s colliery at Michel, Southeast Kootenay, has returned to his home in Vancouver, B.C., ill-health having necessitated his relinquishment of the arduous duties he had been performing at Michel.

Mr. E. L. Warburton, recently appointed to the charge of the Diamond Vale coal mine, in Nicola Valley, British Columbia, has accepted the position of superintendent for the Corbin Coal and Coke Co., operating in Southeast Kootenay, B.C., in succession to Mr. Chas. Graham, now superintendent of the Michel colliery, also in the Crow's Nest district.

Mr. Henry S. Fleming, of New York City, chairman of the executive committee of the Canadian Collieries (Dunsmuir) Limited, operating the Comox and Extension collieries on Vancouver island, B.C., arrived in Victoria from New York, on January 29.

Mr. W. H. Wayne recently examined the Mountain Chief mining property, near Renata, Arrow Lake, B.C., which has been bonded by Mr. G. S. McCarter, of Calgary, Alberta.

Mr. W. M. Brewer, of Victoria, B.C., was in the neighborhood of Agassiz last month investigating a mining property for the British Columbia Department of Mines.

Capt. C. A. Foster has resigned from the 228th Battalion and has been appointed to the aviation branch of the Imperial Munitions Board in charge of construction of flying schools in Canada. The first school is now under construction at Camp Borden and will be in operation April 1.

### Industrial Research and Misinformation.

During the past few months there has been much progress made towards obtaining in Canada greater encouragement for scientific and industrial research. Unfortunately some of the enthusiastic supporters of the movement have not shown themselves to be well informed, and a lot of misinformation is being disseminated.

As we have previously pointed out the mining industry in Canada has taken a leading part in the application of science to industry. Those who are familiar with the work of such organizations as the Mines Branch at Ottawa and the Bureau of Mines at Toronto, and with the research work that is done by mining companies throughout the country will perhaps be surprised to learn that several organizations in Toronto, including the University, through its president, several bank managers, the board of trade and the Canadian Manufacturers' Association, have signed a petition in which it is clearly stated that up to the present there has been no industrial scientific research carried on in Canada with the exception of that done by a few manufacturers.

The reason for signing such a statement may be a good one; but it is an evidence of the fact that many interested men have been misinformed and do not yet realize it.

### CORUNDUM MINING IN ONTARIO.

The Manufacturers Corundum Co., of Toronto, has resumed mining operations in Hastings County, Ontario. There has been little production in Ontario since the company's mill at Craighmont was burned in 1913. A new mill has been constructed at Jewellville and the deposits there are now being mined. Jewellville is the postoffice at Palmer's Rapids in Raglan Township.

The Northwest Milling Association will hold a convention at Spokane, Washington, opening on February 19th and closing on 25th.



## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA.

Some of the newspapers published on Vancouver Island were at the end of January publishing divergent views concerning the position in Island coal mines in relation to the employment of alien enemies in the mines. A news despatch from Victoria stated "that acting upon information which he has received from several up-Island mining centres, to the effect that a number of Austrians and other alien enemies who had been interned in the Morrissey (Crownsnest district) camp and elsewhere, have lately been released and are now working in the mines of Vancouver Island, the Hon. Wm. Sloan, Minister of Mines, has instructed Mr. Thos. Graham, Chief Inspector of Mines, to make a thorough investigation into the matter. While realizing that both the interment and subsequent release of these men are in the hands primarily of the Dominion Government, the Minister of Mines is determined that as long, at least, as he controls the Provincial Department of Mines, this province shall not be made a dumping ground for alien enemies at the cost of depriving loyal subjects of the Empire of a means of livelihood. Under the Coal Mines Regulation Act, the Minister has full power to control the labor situation in the mines, and he is firmly resolved that any such practice as the sending of alien enemies from internment camps to work in mines must be abolished."

Of two newspapers published at Nanaimo, one, in the course of a long editorial says: "We hope that the action which the Hon. the Minister of Mines is taking in ordering his Chief Inspector to investigate the matter very thoroughly may have the desired effect of ridding Nanaimo of the alien incubus which at the present time is threatening to choke it. Such a riddance will, if it is accomplished, without doubt have the effect of temporarily reducing the output of the mines, but this, while no doubt it would be annoying to the American shareholders, who it must not be forgotten are also aliens, would be far more preferable in the long run and less inimicable to the true welfare of the city, than the present high rate of production, maintained by such thoroughly undesirable population." Dealing with another aspect of the question, this editorial concludes as follows: "A coal famine is pressing hardly upon the industries of many parts of Canada to-day, and yet the fuel that would make the continuance of those industries possible, is withheld from them and shipped by the thousands of tons to foreign parts. If the Dominion Government is really sincere in its campaign for national service and conservation, it should take steps to see that Canadian industries are adequately supplied with Canadian fuel before a ton of the latter is allowed to be exported."

The other Nanaimo newspaper, after remarking that it is unfortunate that with certain newspapers prejudice and not reason should be made the court of appeal says further: "There is one point on which there is general agreement. This is that there should be no employment in Canada for alien enemies. . . . We have tried to interest American capitalists in Canadian industries and vice versa. Whether we go to the other side or Americans come to this side, we are all under the law. It might suit some insular British prejudices to build a wall between Canada and the United States, but it certainly would not benefit Canada. For the rest there is nothing to be gained by mis-

representing the local situation. If there is such a thing as a coal famine pressing hardly upon Canadian industries it can hardly be located within striking distance of the Island mines. Such Canadian industries as came within the field of the Island mines got clear of coal famines for all time by putting in oil fuel burners. Then as to output—it is just as well to mix sense with your heroics. No true Canadian, with patriotic instincts, wants to see employment given to enemy aliens. At the same time he does not want any unreasonable interference with the operation of the mines. The better the mines work, and the bigger their output, the better it will be for this city and all in it. There may be something in the idea of conserving the local coal resources. If the town and those in it can stand for it, no doubt the operating company can. The Government would probably have little difficulty in making the deal, whatever happened to the rest of us. Meantime it may be said that during the regime of the Western Fuel Company, Nanaimo has been fairly prosperous. The company has paid better wages and given better conditions than its competitors even if they are British. And so far from exporting coal by the thousands of tons to foreign parts in the present crisis it has leased the ships it had chartered to help out the situation. For these reasons and perhaps because it has no German shareholders and has not thrown a few hundred Orientals into its mines, it is always first choice with a certain class of critics."

### WEST KOOTENAY.

Slocan.—The finding of new orebodies in several Slocan mines is reported. A new shoot of silver-lead ore has been found on the fifth level of the Rambler-Cariboo mine, and ore containing zinc has been opened on the thirteenth level. Another body of ore has been entered in the lowest level of the Galena Farm mine near Silverton. On the 100 ft. level in this mine there was ore in the drift for about 300 ft.; it ranged in width up to 22 ft., and averaged between 8 and 9 feet.

Nelson.—On the Celebration group, La France Creek which is on the eastern side of Kootenay lake, silver-lead ore 18 inches in width has been found at a depth of 50 ft. At the Granite-Poorman group of mines, the cross-cut being driven to open the Hardscrabble vein at 100 ft. greater depth is thought to be nearing the vein, which in the shaft sunk on that claim nearly two years ago well maintained its width, and the gold value in its ore down to a depth of more than 100 ft.

Rossland.—Shipment to Trail of ore from Rossland mines is being continued but the outlook is not promising at present owing to the stoppage of coke shipments to the smeltery from Crowsnest collieries. The report of the Le Roi No. 2, Limited, for November shows that its Josie mine shipped 1,505 tons of ore. Receipts were 19,863 and all expenditures totalled \$8,350.

### OMINECA AND SKEENA.

The Omineca Herald states that at the Rocher Deboule copper mine, the adit at about 2,000 ft. from its portal entered a vein, known as the middle, or No. 3 vein, which had previously been uncovered at the surface. Where cut by the adit the vein is strong, but there is only a little ore there and that of a milling grade. Drifting on the vein will be undertaken in February. Good progress is being made in raising on No. 2 vein.



## COBALT AND PORCUPINE

### Beaver.

A development of more than ordinary significance to the Cobalt Camp as a whole has taken place during the past couple of weeks in the discovery of a series of veins on the Beaver property at a depth of 1,600 ft., the greatest depth at which mining operations have been carried on in the camp.

In driving a crosscut from the Beaver to the Temiskaming, who are also sinking a shaft to the same depth, an eight inch vein of high grade silver, containing approximately 2,000 ounces to the ton was encountered, and the wall rock for three or four feet on each side of the vein contains excellent values in high grade milling ore.

It is said that since the discovery of this vein two weeks ago three small stringers have also been encountered, which leads to the conclusion that there is a series of these veins.

When it is realized that after cutting through the thousand foot diabase sill on the Beaver the same zone as exists in the Cobalt camp on the surface near Cobalt Lake is encountered, the importance of the new development to the Beaver will be readily seen. The company is actively pushing development work on the new finds and much interest is evinced in the work, which is considered to be the commencement of a new era in mining in the southern portion of the camp, where the success of the Beaver will no doubt lead to the opening up of other properties.

### Customs Mill for Kirkland Lake.

It is unofficially stated here that the Dominion Reduction Company will enter the Kirkland Lake field in the near future and erect a customs mill for the treatment of gold ores. This move will be welcomed by a number of the properties in the district, as it would assist them to become producers quicker than would otherwise be possible.

Among the properties that are at present developing and will soon be in need of milling facilities might be mentioned the Kirkland Lake, Lake Shore, Wright-Hargraves, Sylvanite, Orr, and Hunton.

When it was announced that the Dominion Reduction would enter the Kirkland Lake camp, it was also rumored that the Lake Shore mine would cancel their order for a mill. The natural location for a mill would be in close proximity to this property, hence the opportunity of foregoing the installation of a mill was said to be welcomed by the company.

Mr. Eugene Steindler, president of the Dominion Reduction is in New York at the present time, where he is understood to be formulating plans for the early commencement of the work.

Two mines in this district have already installed mills; the Tough-Oakes, which has been in operation for a number of years and is the pioneer mine of the district, and the Teek-Inghes.

It is a good commendation of the future of the Kirkland Lake camp that the Northern Ontario Light & Power Company is expending the sum of \$300,000 in constructing the power line to the camp, a distance of sixty-five miles. Owing to the prevailing war conditions this company has had to deal with many handicaps in the way of slow delivery of plant and equipment, however it will only be a short time now until everything is working smoothly, and Kirkland Lake should soon forge ahead as one of the great mining camps of the North.

### Crown Reserve.

The discovery of a four inch vein of high grade is reported at the Crown Reserve mine. This will come as a surprise to the shareholders, who were informed at the annual meeting of the company in Montreal recently that the outlook for this property was very poor and that unless new orebodies were discovered it was only a matter of a short time until they would have to discontinue operations. The new find is on the 700-foot level, and with the excellent results being obtained at depth on the Beaver it is expected that the Crown Reserve will push development as rapidly as possible. It would not be surprising if they opened up a large body of paying ore at this new working.

### Ophir.

So far nothing of great importance has been encountered in the work being done at the Ophir property which is being worked from the shaft on the People's Mining Company's property. Drifting is being continued on a strong calcite vein but up to the time of writing commercial values have not been encountered.

### National Mines.

The National Mines, Cobalt, (formerly the King Edward) is crosscutting to the contact at the 1,000 foot level of the mine, in the hope of encountering a strong silver vein which is running in the direction of their property from the O'Brien mine, at a slope which if it continues to the King Edward should be encountered at this depth on the National property. The company has recently installed a small oil flotation plant and will treat the ore and tailings from the dump. This can be accomplished with a very fair margin of profit.

### Flotation at Coniagas.

The Callow oil flotation process was put in operation at the Coniagas mine on Monday night of this week, and marks another step forward in the career of this famous mine.

The Coniagas is at present treating from 250 to 300 tons of ore daily in the 60-stamp mill and will be able to handle an additional one hundred and fifty tons of tailings from the huge sand pile which has accumulated on the property and is said to contain an average of five ounces of silver to the ton.

By the new oil process it will be possible to recover approximately three ounces of silver from these tailings. This, at the present price of the metal will net the company around \$9,000 per month, and will lengthen the life of the mine considerably.

### SILVER PRICES.

|          |         | New York,<br>cents. | London,<br>pence. |
|----------|---------|---------------------|-------------------|
| January  | 20..... | 76 $\frac{3}{4}$    | 37 $\frac{1}{4}$  |
| "        | 22..... | 76 $\frac{1}{2}$    | 37                |
| "        | 23..... | 76 $\frac{1}{2}$    | 37 $\frac{3}{8}$  |
| "        | 24..... | 76 $\frac{1}{2}$    | 37 $\frac{3}{8}$  |
| "        | 25..... | 76 $\frac{1}{2}$    | 37 $\frac{3}{8}$  |
| "        | 26..... | 77                  | 37 $\frac{3}{8}$  |
| "        | 27..... | 76 $\frac{3}{4}$    | 37 $\frac{1}{4}$  |
| "        | 29..... | 76 $\frac{3}{4}$    | 37 $\frac{1}{4}$  |
| "        | 30..... | 76 $\frac{3}{4}$    | 37 $\frac{5}{8}$  |
| "        | 31..... | 76 $\frac{3}{4}$    | 37 $\frac{5}{8}$  |
| February | 1.....  | 76 $\frac{3}{4}$    | 37 $\frac{5}{8}$  |
| "        | 2.....  | 76 $\frac{3}{4}$    | 37 $\frac{3}{8}$  |
| "        | 3.....  | 76 $\frac{3}{4}$    | 37 $\frac{5}{8}$  |
| "        | 5.....  | 76 $\frac{3}{4}$    | 37 $\frac{3}{4}$  |

## MARKETS

## TORONTO MARKETS.

Cobalt oxide, black, \$1.05 per lb.  
 Cobalt oxide, grey, \$1.15 per lb.  
 Cobalt metal, \$1.25 to \$1.50 per lb.  
 Cobalt anodes, \$1.50 to \$1.75 per lb.  
 Nickel metal, 45 to 50 cents per lb.  
 White arsenic, 5½ to 6 cents per lb.

Feb. 9, 1917—(Quotations from Canada Metal Co., Toronto)—

Spelter, 13½ cents per lb.  
 Lead, 11 cents per lb.  
 Tin, 60 cents per lb.

Antimony, 32 cents per lb.  
 Copper, casting, 35½ cents per lb.  
 Electrolytic, 36½ cents per lb.  
 Ingot brass, yellow, 23 cents; red, 24½ cents per lb.

Feb. 9—(Quotations from Elias Rogers Co., Toronto)—

Coal, anthracite, \$9.50 per ton.  
 Coal, bituminous, nominal, \$10 to \$14 per ton.

## NEW YORK MARKETS.

Straits Tin, spot, nominal

Copper—

Prime Lake, nominal.  
 Electrolytic, nominal.  
 Casting, nominal.

Lead, Trust price, 8.00 cents.

Lead, outside, nominal.

Spelter, prompt western shipment, nominal, 9.92½ cents.

Antimony—Chinese and Japanese, nominal, 25.00 cents.

Aluminum—nominal—

No. 1 Virgin, 98-99 per cent., 57.00 to 59.00 cents.  
 Pure, 98-99 per cent. remelt., 51.00 to 53.00 cents.  
 No. 12 alloy remelt, 37.00 to 39.00 cents.  
 Powdered aluminum, 85.00 to 90.00 cents.

Metallic magnesium—99 per cent. plus, \$3.00 to \$3.50.

Nickel—shot and ingot, 45.00 cents.

Electrolytic, 50.00 cents.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$90.00.

Platinum—

Pure, \$100.00.  
 10 per cent. Iridium, \$105.00.  
 Cobalt (metallic), \$1.50.  
 Tungsten ore per unit, \$17.00 to \$17.50.

Silver (official), 76¾ cents.

Metal Products—Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

Sheet Copper—

Hot rolled, 42.00 cents.  
 Cold rolled, 43.00 cents.

Copper bottoms, 50.00 cents.

Copper in rods (round), 41.00 cents.

Square and rectangular, 42.00 cents.

Copper wire, nominal, 38.75 to 39.75 cents.

Copper wire, May, June, 37.00 cents.

High brass—

Sheets, 39.00 to 40.00 cents.  
 Wire and light rods, 40.00 cents.  
 Heavy rods, 38.00 to 39.00 cents.

Low Brass—sheet wire and rods, 42.00 cents.

Tubing—

Brazed bronze, 51.00 to 52.00 cents.  
 Brazed brass, 48.00 to 49.00 cents.  
 Seamless copper, 45.00 to 46.00 cents.  
 Seamless brass, 43.00 to 45.00 cents.

Seamless bronze, 52.00 cents.  
 Full lead sheets, 9.25 cents.  
 Cut lead sheets, 9.50 cents.  
 Sheet zinc, f.o.b. smelter, 21.00 cents.

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell & Co., Toronto.)

As of close February 8th, 1917.

## New York Curb.

|                               | Bid.  | Asked. |
|-------------------------------|-------|--------|
| Boston and Montana .....      | .62   | .65    |
| Canada Copper .....           | 1.50  | 1.62   |
| Dome Extension .....          | .30   | .31    |
| Hargraves. . . . .            | .19   | .20    |
| International Petroleum ..... | 11.37 | 11.62  |
| Kerr Lake .....               | 4.62  | 4.87   |
| La Rose Con. ....             | .50   | .56    |
| McIntyre .....                | 1.87  | 1.93   |
| North Amer. Pulp & Paper..... | 6.50  | 7.25   |
| Nipissing. . . . .            | 7.62  | 7.87   |
| Temiskaming. . . . .          | .57   | .59    |
| Thompson-Krist .....          | .22   | .25    |
| Tommy Burns .....             | .30   | .35    |
| Vipond .....                  | .52   | .56    |
| Victoria Oil .....            | 1.31  | 1.37   |

(Standard Exchange, Toronto)

## Porcupine Stocks.

|                          | Bid.  | Asked. |
|--------------------------|-------|--------|
| Apex. . . . .            | .11   | .11½   |
| Davidson .....           | .77   | .78    |
| Dome Extension .....     | .30½  | .31    |
| Dome Lake .....          | .30   | .33    |
| Dome Mines .....         | 20.75 | ...    |
| Gold Reef .....          | ...   | .04    |
| Hollinger Con. ....      | 6.50  | 6.55   |
| McIntyre .....           | 1.85  | 1.87   |
| Moneta .....             | .14   | .15    |
| Porcupine Crown .....    | .67   | .69    |
| Porcupine Imperial ..... | .03½  | .04    |
| Porcupine Tisdale .....  | .03½  | .04    |
| Vipond .....             | .51½  | .52    |
| Preston East Dome .....  | .06¼  | .06½   |
| Schumacher. . . . .      | .69   | .70    |
| Teck Hughes .....        | .70   | .73    |
| West Dome .....          | .30   | .30½   |
| Boston Creek Mines ..... | 1.14  | 1.15   |
| Vacuum Gas and Oil ..... | .35½  | .42    |
| Thompson Krist .....     | .20   | .23    |

## Cobalt Stocks.

|                         | Bid. | Asked. |
|-------------------------|------|--------|
| Bailey. . . . .         | .06  | .06½   |
| Beaver Con. ....        | .45  | .45½   |
| Chambers Ferland .....  | .15  | .16    |
| Coniagas .....          | 4.15 | ...    |
| Crown Reserve .....     | ...  | .38    |
| Hudson Bay .....        | ...  | 55.00  |
| Kerr Lake .....         | 4.85 | ...    |
| La Rose .....           | .50  | .52    |
| McKinley Dar. Sav. .... | .50  | .52    |
| Nipissing. . . . .      | 7.70 | 7.85   |
| Peterson Lake .....     | .10½ | .11    |
| Right of Way .....      | .04½ | .05    |
| Temiskaming. . . . .    | .57½ | .58½   |
| Trethewey. . . . .      | .15  | .17    |
| Wettlaufer .....        | .07¼ | .08    |



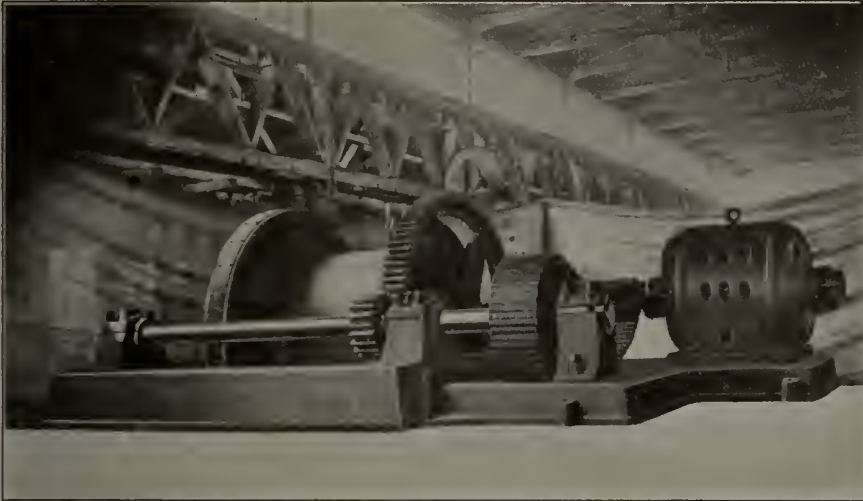
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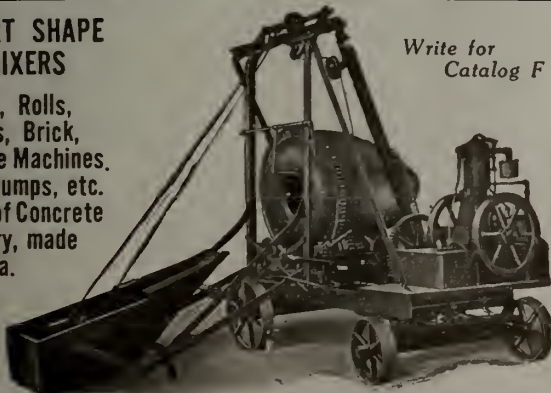
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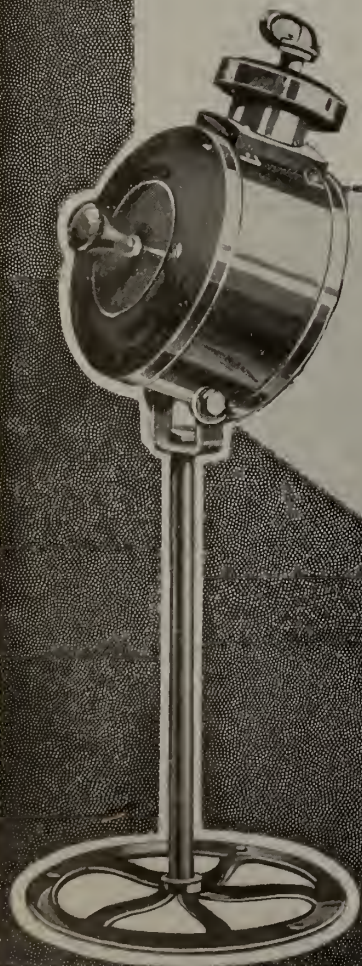
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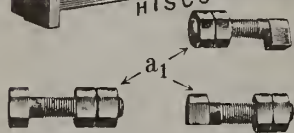
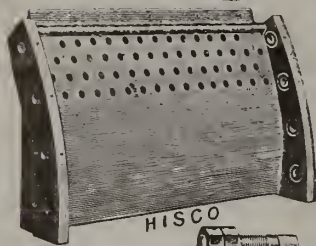
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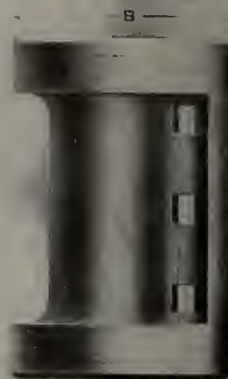
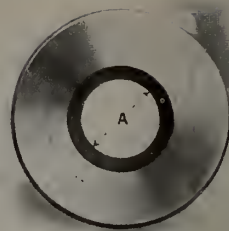
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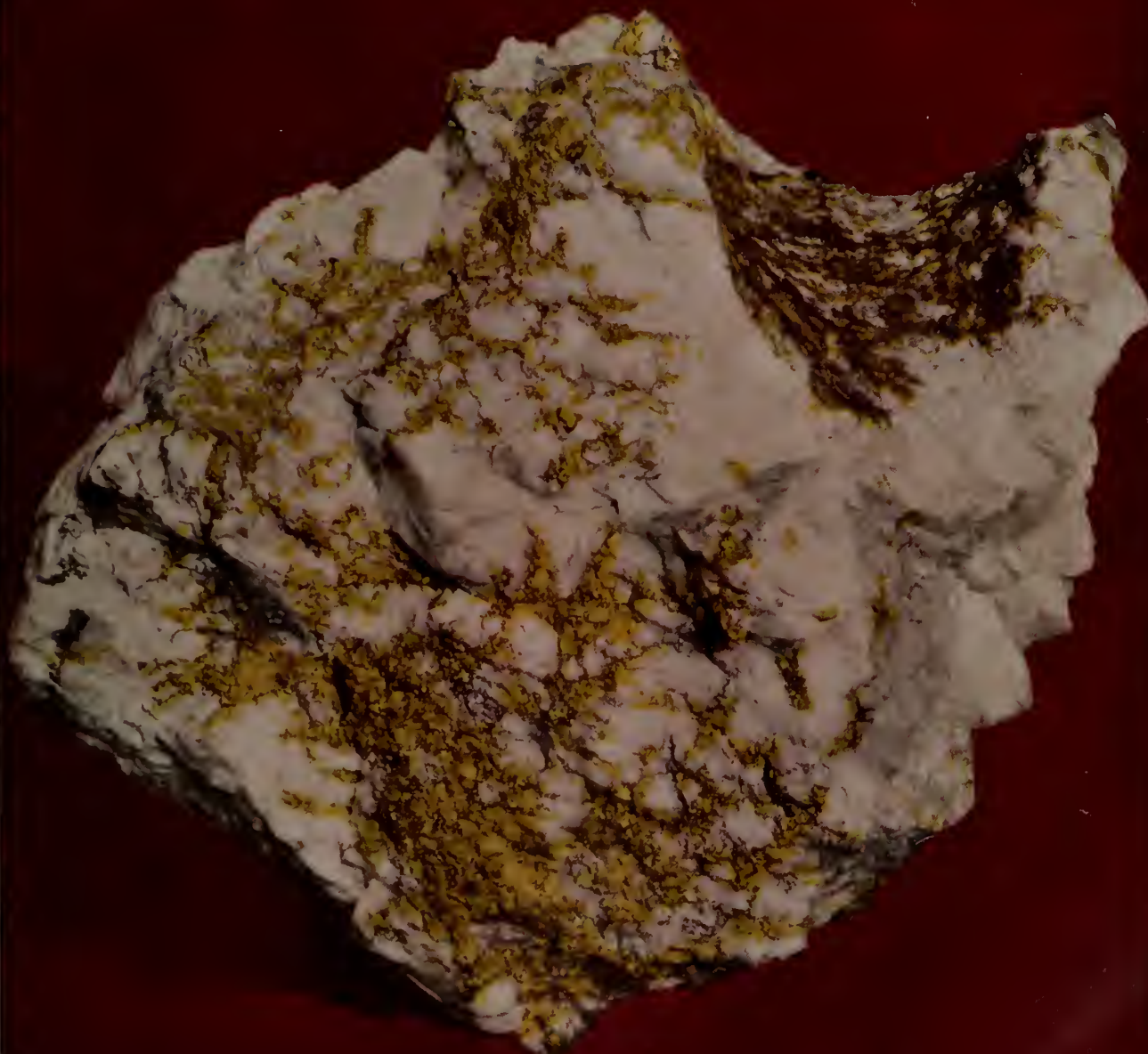
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VOL. XXXVIII

TORONTO

No. 5



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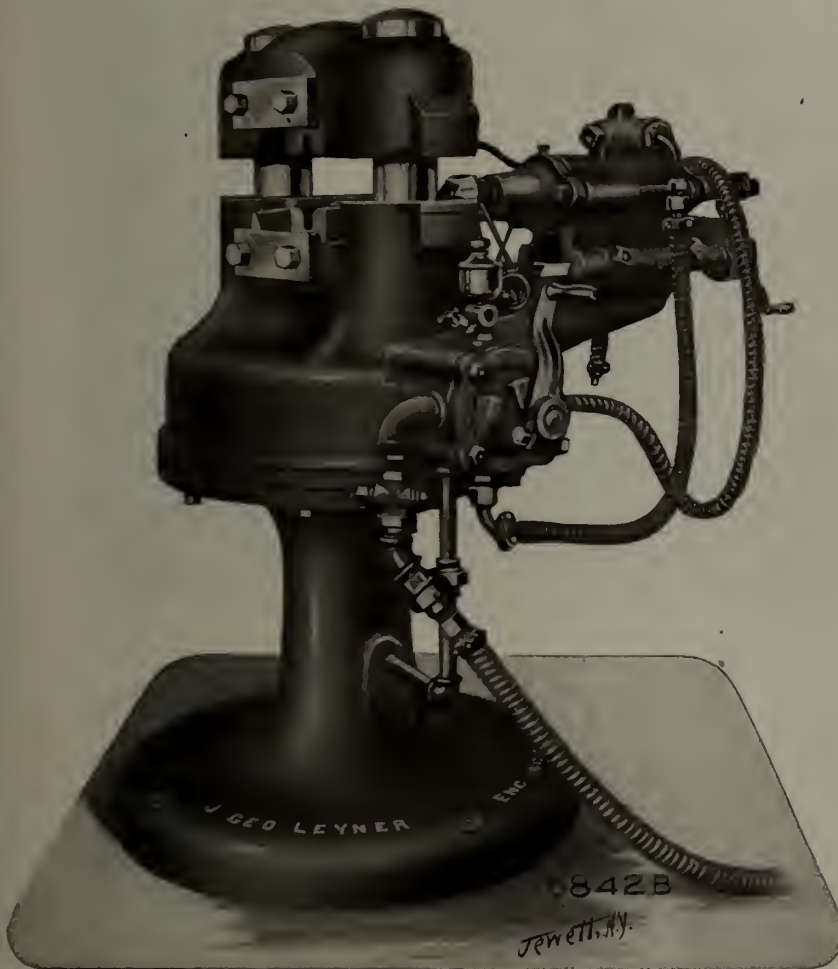
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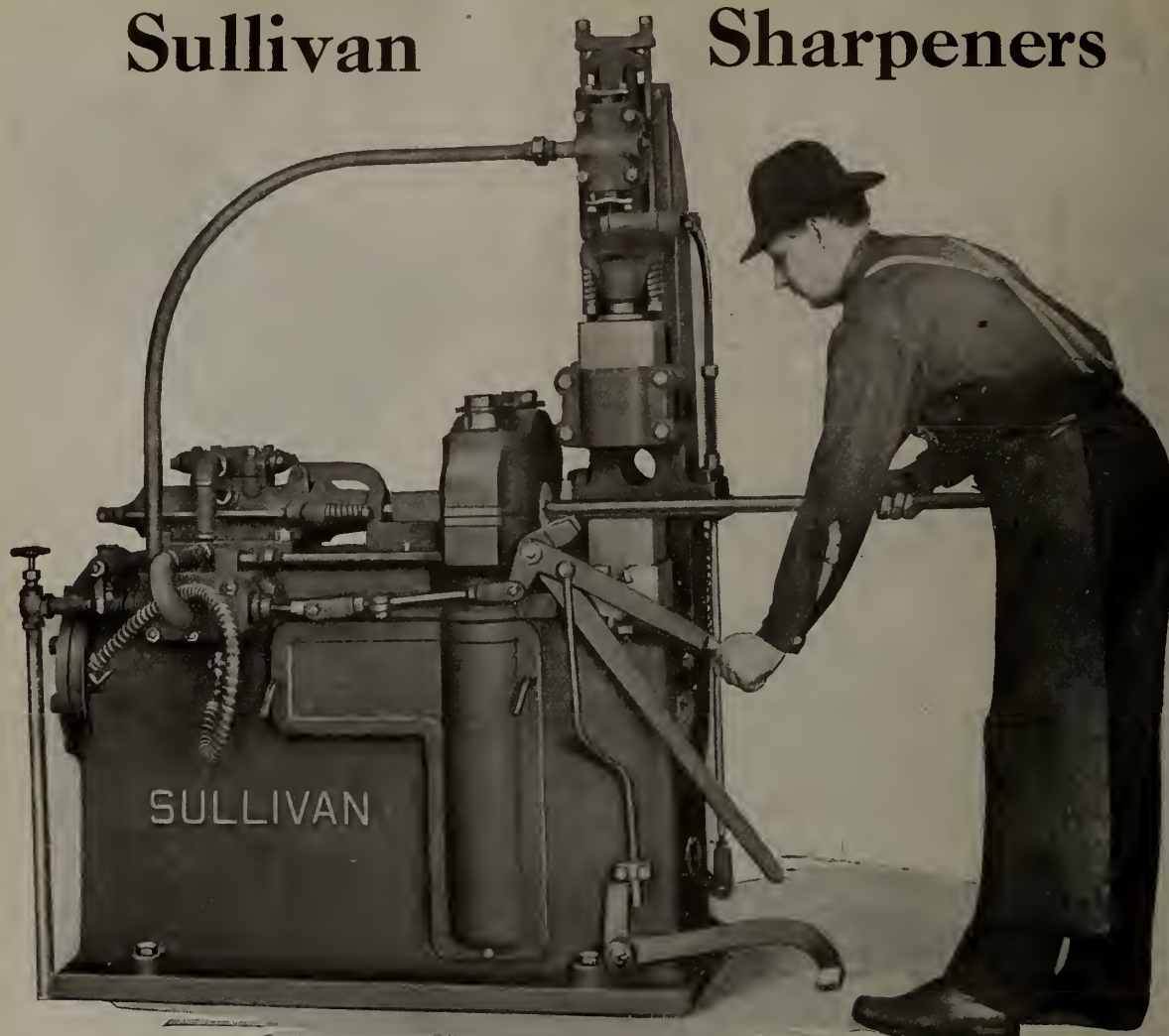
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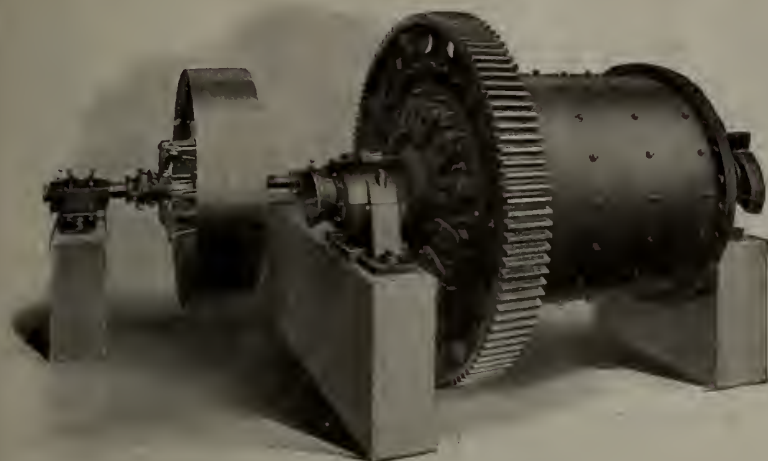
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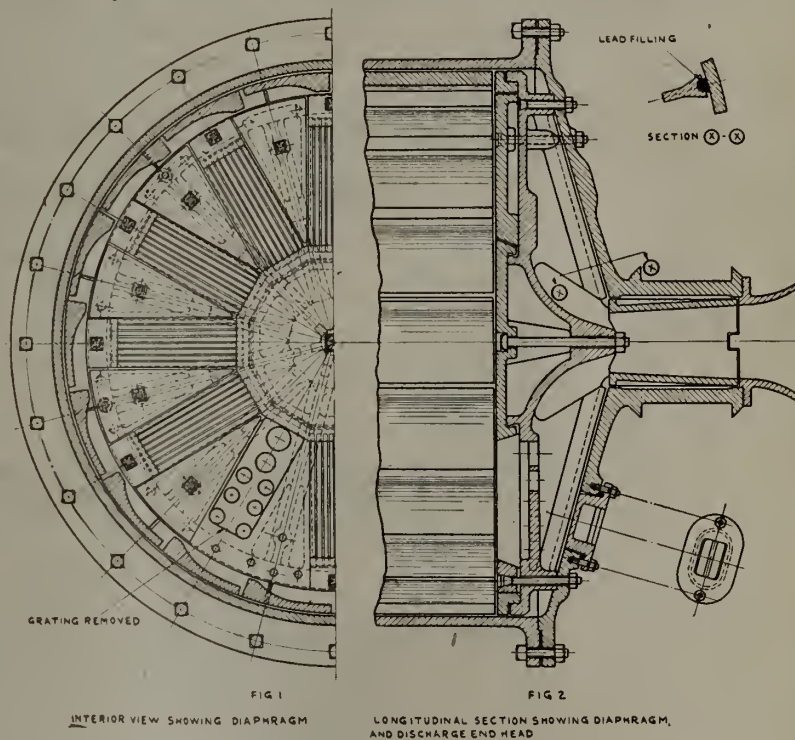
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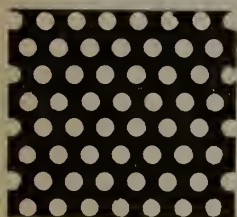
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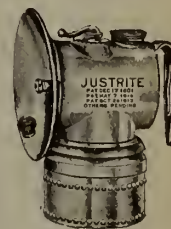


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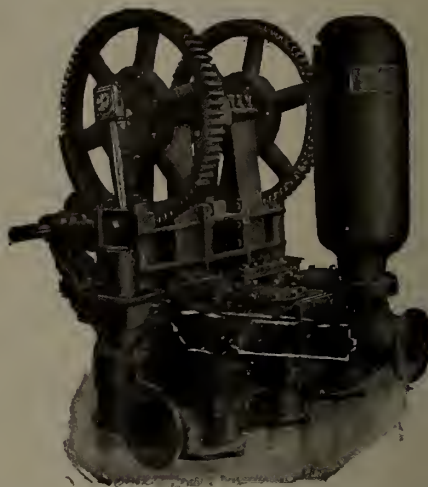
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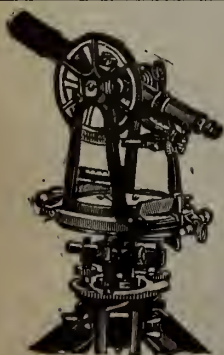
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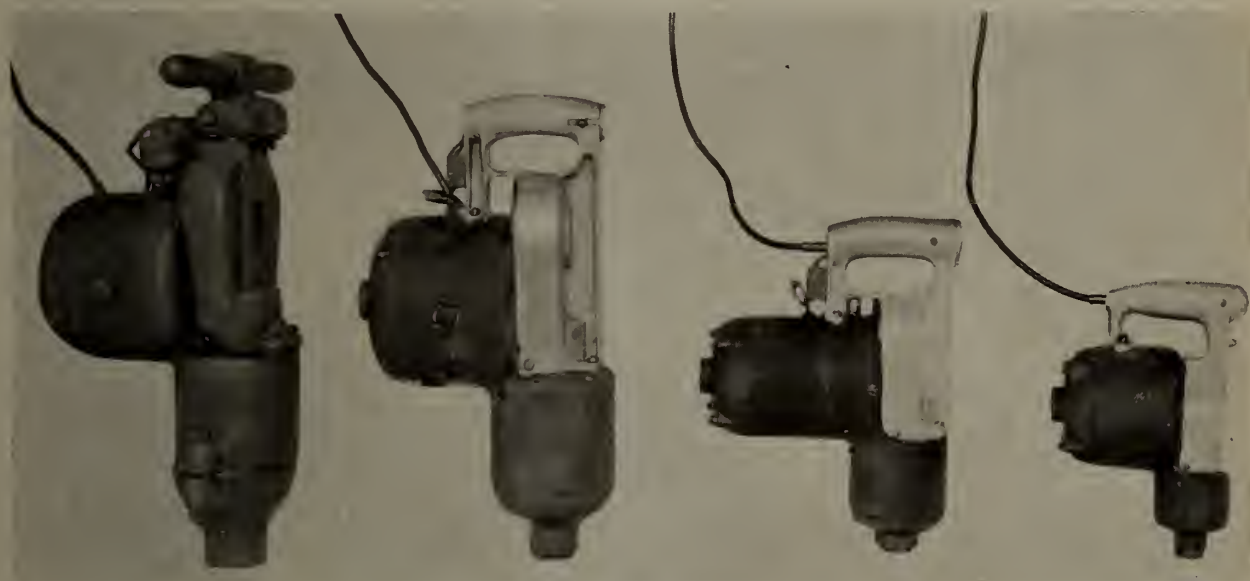
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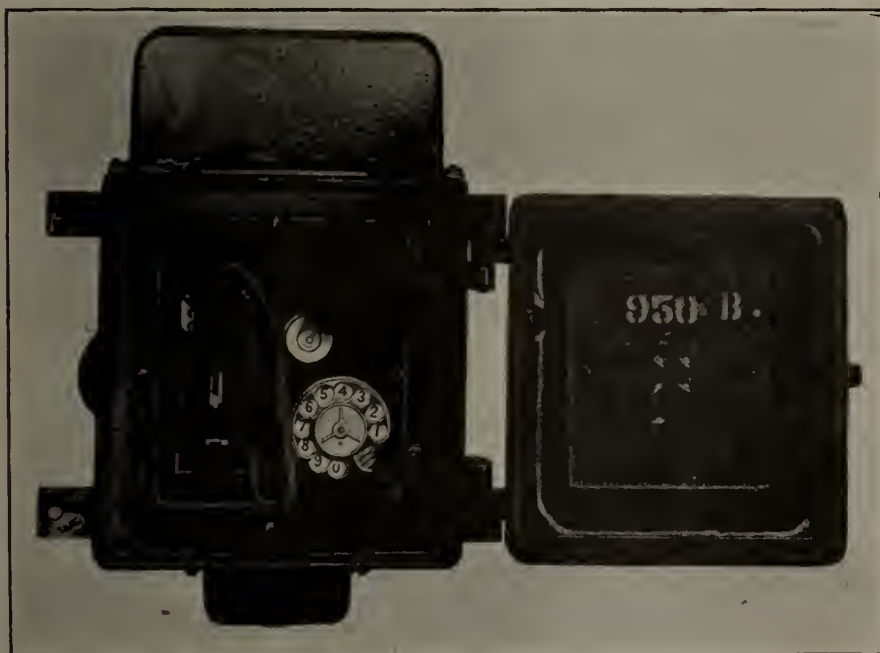
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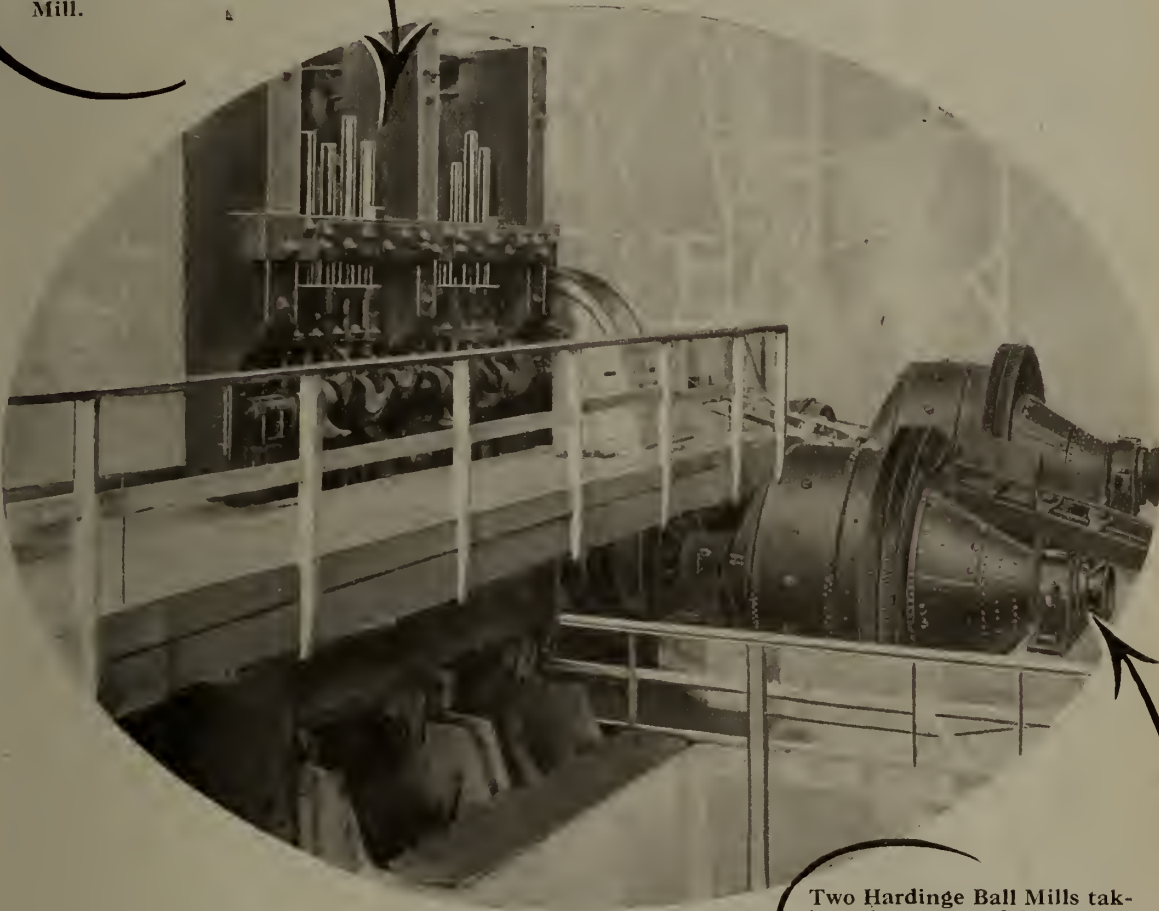
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, March 1st 1917.

No. 5

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

Head Office . . . . 263-5 Adelaide Street, West, Toronto

Branch Office . . . . . 600 Read Bldg., Montreal

Editor

**REGINALD E. HORE**

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### GOLD AND SILVER

This number of the Journal is devoted chiefly to a review of mining in Northern Ontario, special attention being given to gold and silver.

Ontario has for some years been known to mining men throughout the world as the world's chief producer of nickel. During the past decade the province has been also one of the world's chief producers of silver. Thanks to the recent discoveries Ontario is now becoming noteworthy as a producer of gold.

Ontario's chief gold mines are in the Poreupine district, where important discoveries were made in 1909. Three large mines, the Hollinger, Dome and McIntyre, have been developed in this district and will be large producers for many years. Several other properties have been developed and a few of these are regular producers, though small in comparison with the big three.

Kirkland Lake is Ontario's second gold district. One mine here, the Tough-Oakes, is a regular producer and several properties are nearing the productive stage. Recent developments in the Kirkland Lake districts have been especially encouraging.

Ontario's richest gold mine is the Croesus, in Munro township. This property is a phenomenal one, the ore being exceedingly rich. Some notes on this property will be found on another page. Our front cover illustrates the rich ore.

The Cobalt district is Ontario's chief silver producer. Important deposits have been worked at Gowganda, and during the past year a large body of high grade silver ore has been developed there. Most of our silver comes however from a small area near the town of Cobalt.

### THE WORK OF THE COMMISSION OF CONSERVATION.

We have recently received a copy of the seventh annual report of the Commission of Conservation. Nine pages of this cloth bound volume are devoted to the work of the Committee on Minerals. From these pages it is apparent that the Commission still believes that one of its chief objects should be the publication of glowing accounts of the possibilities of imaginary resources.

Referring, on page 112, to the phosphate deposits at Banff, the committee on minerals says "though these beds are not commercially valuable at present, there is very little doubt that prospecting will disclose valuable deposits." As a matter of fact, there is very considerable doubt, and the Commission is or should be well aware of it.

Referring to the possibilities of producing potash in Canada, the Commission publishes, on page 114, the following: "we have, in our granites, enormous deposits of silicate of potash and feldspar. These are now awaiting the perfecting of a method to extract supplies from the old granite rocks." The Commission does not think it advisable however to remark that the old granites will likely be awaiting for some time.

### THE UNITED MINE WORKERS OF AMERICA IN CANADA.

It is announced from Calgary that the coal operators of District No. 18 of the United Mine Workers of America have decided not to make any further agreement with this union. The decision to refuse any further signing of agreements is, the operators say, a result of the action of this union in disregarding its signed agreements by making new demands, more than once, before the expiration of the agreements.

The action of the Crow's Nest Pass and Alberta coal operators in signing agreements with the United Mine Workers of America has always—to use the mildest possible term—met with the disapproval of the operators in Nova Scotia, and on the British Columbia coast. The agreement which the United Mine Workers require an operator to make is one that no self-respecting British employer can properly sign, because it gives to the union and its representatives practical control of the discipline of the mine. In every case it substitutes the union official as the medium of conversation and negotiation between the workmen and the employer. The United Mine Workers further insist on taking into their ranks certain minor officials which in every mine in Great Britain and in Canada—other than those in Canada that have foolishly and weakly consented to this arrangement—are reckoned among the officials and therefore debarred from membership in a trades union.

The coal operators of Nova Scotia and Vancouver Island refused consistently to have anything to do with this alien organization, and when the operators of the Crow's Nest Pass and Alberta entered into agreements, they did so with their eyes open, knowing full well the record of the United Mine Workers. This organization has no place in Canadian matters. Its headquarters are in the United States, and as everybody knows, there is the gravest reason to suppose that recent disturbances of the coal trade in the Western Provinces have not been unconnected with German influences.

If the coal operators of that portion of British territory that this alien organization carries on its books as "District No. 18" have decided to have no further dealings with the U.M.W. of A., they will do the only thing that is possible, if they wish to stay in the coal business and manage their own collieries. Mistakes can be retrieved, and recognition of the U.M.W. of America anywhere in Canada was, is and always will be the beginning of trouble for the coal industry. Nothing more than a perusal of the record of this union in Canada since it first made its unfortunate entrance is necessary to convince the reader that the sooner its activities are confined to the United States the better for Canada, and for this record the reader is referred to the reports of the Department of Labor at Ottawa.—F. W. G.

### PROPOSED JOINT ENGINEERING SOCIETY.

At the recent meeting of the Canadian Society of Civil Engineers a proposal was made to change the name of the society to "Canadian Society of Engineers" or "Canadian Institution of Engineers," and to extend the organization so as to include electrical, chemical, mining and mechanical engineers.

Commenting on the proposal "Electrical News" says:

"In favor of such a change it can be said that within narrow limits the word "civil" at the time of the organization of this society thirty years ago, was understood to include all kinds of engineering, which broad interpretation has gradually disappeared, however, as the other branches of engineering have developed. It could thus be argued that in dropping the word "civil" the new name would merely represent what the originators of this honored organization intended it should represent.

"There are other arguments too, doubtless, that must have more or less bearing on the subject. Take the electrical engineers for example. Failing a strong parent organization of Canadian origin, the electrical men have very largely associated themselves with a foreign society. The same is true of other branches, and this would seem to indicate, if nothing else, that the various engineering branches in Canada are not yet numerous and powerful enough to support separate Canadian societies. They should, however, be able to support one such, and the scheme which seems to offer the best promise of being of the greatest good to the greatest number is the change now being advocated for the Canadian Society of Civil Engineers—that is, make it a Canadian society of engineers, and let it here be governed by a board of representatives, elected by all the branches of the engineering profession in Canada, who should have equal standing. This surely means unity, and unity means better organization and more effective work."

So far as mining is concerned the above remarks are not applicable. The Canadian Mining Institute is undoubtedly one of the best organizations of its kind anywhere.

According to the accounts published in some of the newspapers of developments at some prospects in the Porcupine gold district marvelous orebodies are being developed. Strangely enough those who are familiar with the properties and with the operations seem to be unaware of the existence of this ore. It might be well for the shareholders to enquire for the facts on which the statements made in the daily press concerning such properties as Tommy Burns and Davidson are based.

During 1916 Hollinger Consolidated expended approximately \$800,000 for supplies used in operations and \$400,000 more in construction work.



Anyone who imagines that individual scientific research is not accomplishing anything in the mining industry in Canada will do well to read Mr. R. B. Watson's articles in this issue on recent advances in metallurgy at Cobalt. We recommend it to those who signed that memorandum in which it was stated that there is no scientific industrial research work being done in Canada except in the laboratories of a few manufacturers.

Shortage of skilled labor is making itself felt in Porenpine as in most other industrial centres. Unfortunately for the producers, the price of gold remains stationary while the cost of supplies keeps mounting. Unfortunately also many of the men now employed are not as good workers as those who are now in the army. It is not surprising therefore that some consider it inadvisable to offer increase in wages, even though it should result in a decrease in production or even in temporary suspension of operations.

Owing to the difficulty of getting work done as planned there has been recently considerable disappointment with the Hollinger production. The Hollinger is a splendid mine, one of the best in the world, and will make large profits for its shareholders; but it is handicapped by the difficulty of making huge dividends before it is suitably equipped with men and machinery. At the time of the announcement of the consolidation of the Hollinger properties, ten months ago, a plan for equipping the properties, at a cost of \$750,000, for a large production was announced. It was then expected that by this time the earnings would be so large as to warrant the payment of a dividend of \$240,000 every four weeks. The company has been paying this dividend in spite of the difficulties that have arisen; but it is evidently a very heavy burden. The directors doubtless are considering the advisability of reducing the dividend until the mine is in better shape to maintain the desired production.

The news of the award of the Military Cross to Lieut. Jas. G. McMillan, one of Ontario's mine inspectors, was received with delight by his friends here. That he would distinguish himself at the front was expected.

The increased cost of supplies for mining operations is indicated by an item of 10 tube mills and 100 stamps which cost the Hollinger company \$93,045 in 1916. The cost in 1914 would have been \$59,115. The import duty was \$21,861 as compared with \$11,699.

The annual meeting of the Canadian Mining Institute will be held in Montreal, March 6th, 7th and 8th. The excellent list of papers to be presented will doubtless bring out considerable discussion. It will be a meeting well worth attending.

Some of the best underground photographs ever taken are those of Cobalt silver deposits taken by Mr. A. A. Cole. In this issue we reproduce two of these with Mr. Cole's article.

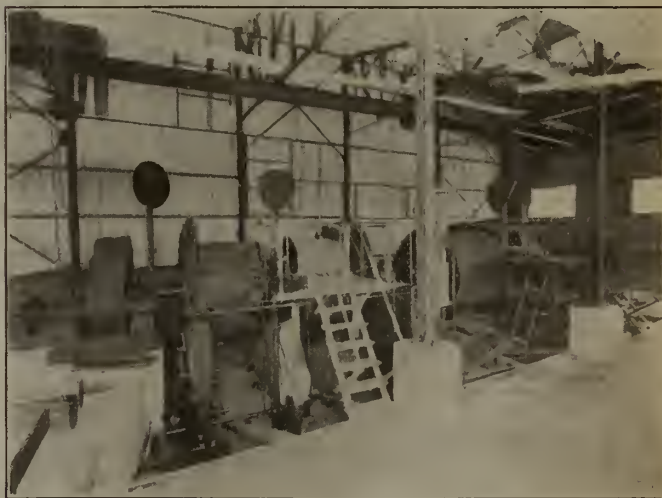
The piece of ore reproduced on our first cover is one of five purchased by the Ontario Bureau of Mines. This ore is so rich that it is difficult to exhibit it in the ordinary way. Thanks to the careful work of our press foreman, we are able to show an excellent picture of the ore.

Provided there are no great delays in deliveries of apparatus by manufacturers, Manager Robbins expects that the Hollinger will have plant ready to treat nearly 3,000 tons ore daily by the end of May.

### EXTENSIONS TO HOLLINGER MILL.

In enlarging the Hollinger mill it was proposed a year ago to increase the capacity by 1,600 tons. This was cut down to 1,000 tons. It is now stated that the plant for the additional 600 tons will be completed as soon as possible after the present addition is in running order. Manager Robbins says in this connection.

"Several months ago we were forced to recognize two facts: first, that we could not hope to complete the entire 1,600 ton extension to the mill within the time expected, and, second, that with the limited amount of underground development being accomplished we should not be able to feed the entire mill even if it were completed. The obvious answer to these conditions was to reduce the capacity of the entire mill extension, and although we have completed the buildings and the machinery foundations for the entire extension, we are installing only sufficient plant at present to treat an additional 1,000 tons per day. It is our intention to complete the entire mill extension without delay after the first part of the addition is in running order. This plan will enable us to spread the cost of construction over a long period, while at the same time we shall have an opportunity to carry out the necessary work of developing the ore with which the mill is to be fed."



New hoist room, Dome Mine.

# MINES OF THE FUTURE

By G. C. Bateman.

The development of the precious metal mines in Northern Ontario has taken place within a comparatively few years and this country still offers probably the greatest chances of any mining section in Canada for the discovery and development of new mines.

As a large number of former prospectors are now in the army or working in munitions factories and as greater attention is being given to production than to development, there were very few men out prospecting last summer. The development of the different camps has however been so satisfactory and the country still offers such opportunities that with the return of normal times and with a plentitude of money in Canada and the United States, which seems assured, prospecting will again be carried on vigorously. The different mining companies in the country are aggressive in their search for new properties, so that the prospector finds a ready market close at hand for what he may discover.

The areas that offer the greatest possibilities for the prospector and the purchaser are probably those in the vicinity of existing mining camps. A good place to search for a new mine is in the vicinity of known ones, provided however that the camp is still young.

In Porcupine, as the geological characteristics become better known and appreciated, the boundaries of the proven mineral zone are gradually extending. Further development on some of the known mines will tend to prove the value of adjoining properties; as is the case with the probable continuation at depth of the Dome ore bodies into the Dome Extension ground.

Of more immediate interest however is the work being carried on by new companies in the district. Here a number of properties are being worked in an effort to develop new mines. While some of these are being operated more with an eye to the stock ticker than to mine development, there are also many real efforts being made to develop mines. Some of these efforts are meeting with a fair measure of success, and it is not unlikely that proceeded sufficiently far to permit of a definite statement that the properties will become profitable undertakings.

In addition to the territory immediately contiguous to the producing mines there are large areas in the surrounding district where the geological conditions justify a much closer investigation than has yet been given them.

Kirkland Lake is the next most important gold camp to Porcupine and is in fact the second most important gold camp in Canada to-day. While production to date is comparatively small there is no other gold mining camp in Canada which has the same number of properties under development that give definite promise of becoming profitable mines. Development is proceeding on careful and intelligent lines and within the next year or so there should be at least four new producers in this camp. The developed area is small but the result of the work on the known properties justifies a more extensive campaign of exploration and development in the surrounding district.

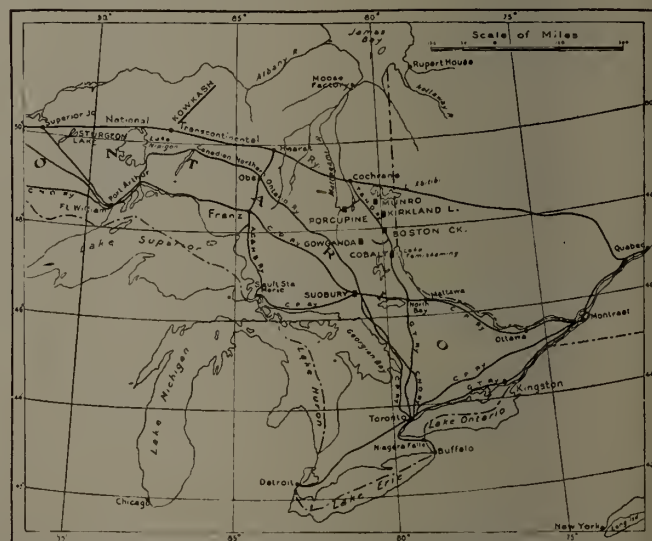
In addition to these two well known camps there are a number of places where promising results have been obtained. These sections are worthy of close study.

In the past few years most of the prospecting has been for gold but the report of a new silver discovery will always create excitement. On the Miller Lake-O'Brien property in Gowganda a remarkable vein was found a few months ago and this will undoubtedly create renewed interest in that section. More activity in Gowganda may be looked for in the spring.

In Cobalt the most important new discovery has been the finding of silver on the 1,600 foot level of the Beaver mine. Should this prove as important as it gives promise of being, it will result in further exploration at depth of adjoining properties and may result in the development of new mines.

With the gradual opening up of the country the field for the prospector is being correspondingly extended. To date practically all the prospecting and development has been confined to those sections close to the main waterways and to the railroads; but the prospectors are gradually going farther afield and will undoubtedly open up new and profitable fields for mining investment.

Geology is playing a more and more important part in prospecting and exploration work and the men in the field in Northern Ontario are greatly indebted to the Provincial Geologists for the very complete reports and maps issued by them.



Sketch map showing location of Porcupine, Kirkland Lake, Munro, Boston Creek and Kowkash gold areas.

## HOLLINGER EMPLOYEES RECEIVE \$100,000 MONTHLY.

The Hollinger mines employed 1,056 men during 1916 and paid wages amounting to \$1,223,433 and bonuses amounting to \$36,793. Each employee who has gone on overseas service with the British forces has been presented by the directors with 100 shares of stock in Hollinger Consolidated Gold Mines.

Important advances have been recently made in treating the Cobalt silver ores and our readers will find in this issue a very interesting article by Mr. R. B. Watson on the metallurgy of the Cobalt silver ores.



## RECENT PROGRESS AT COBALT.

By A. A. Cole.

Two important factors have within the last year been working to stimulate the silver production of the Cobalt District, viz.: (1) rise in the price of silver, and (2) flotation.

(1) When we consider that the average price for 1915 was 49.68 cents per oz. and that a low level of 46.25 was actually touched, and then compare this with 65.66 cents for 1916 and 75.63 for January, 1917, it is self evident that such a rise in the price of silver is

bound to quicken production. Even when we take into account the increased cost of production, such a rise will mean in many cases a 50 per cent. increase in profits.

(2) Oil flotation for the concentration of low-grade silver ores has already gained a strong foothold in Cobalt. It is not at all likely that this method of concentration will supersede the standard methods of concentration already in use in the camp, but in many cases it can be made a valuable addition to the existing plants and the extraction bettered with only a small additional cost.



A COBALT SILVER DEPOSIT.

These smaltite veins in the McKinley-Darragh Mine assayed 2,200 oz. silver per ton. Wall rock 10 in. wide is of milling grade. Ore shoot over 2,000 ft. Veins cut off by fault, throw 40 ft.

Mr. Thomas R. Jones, general manager of the Buffalo Mines, was the pioneer in flotation experimentation in the Cobalt District. A 50-ton unit was installed and run for eight months at the Buffalo mine, and in that time demonstrated the applicability of oil flotation for the concentration of Cobalt silver ores. Then this was replaced by the present plant of 600 tons daily capacity. This example was followed by other mills adding flotation to their equipment, till at present the daily capacity of the flotation plants of the district amounts to 1,800 tons, and this amount will doubtless be still further increased in the future.

In making up ore reserves certain wall rocks or low grade veins which have previously been rejected as too low grade to work may now be included on account of the rise in the price of silver and the introduction of flotation. In some cases this will actually double the tonnage of the ore reserves.

The handling of the flotation concentrate was another real problem that had to be grappled with and solved before the full benefit of oil flotation could be realized. Here again Mr. Jones blazed the trail. With a chloridizing roast and using the Holt-Dern roasting process it is confidently expected that the difficulty of preparing this flotation concentrate for market will be overcome.

The war has been responsible for a rise in the prices of most of the supplies used in winning the metals and this is particularly the case as regards certain mill supplies. At the Nipissing mill large quantities of aluminum dust were formerly used to precipitate the silver from the cyanide liquor. With the rise in the price of aluminum a cheaper method of precipitation was looked for.

Mr. J. J. Denny, who is in charge of the Nipissing Company's research department, has worked out a continuous method of precipitation with sodium sulphide, with a final desulphurisation with aluminum in a caustic soda solution. This it is claimed is so much cheaper than the aluminum dust precipitation at present prices that it is now regularly installed and has been working satisfactorily in the Nipissing mill for several months.

The geology of the Cobalt District has always been a fruitful source of speculation and has been particularly interesting to the operators. It has long been considered axiomatic that the ore was more likely to occur in paying quantities in comparative proximity to either the upper or lower contact of the diabase. At Cobalt proper only the lower area was left as the upper contact and in most cases the diabase itself was eroded. In South-east Coleman, from the Hargraves south, the area near the upper contact was available and it was here that the main ore shoots of the Temiskaming and Beaver have been found. Mr. Frank L. Culver, general manager of the Beaver and Temiskaming Mines, has for several years been planning a campaign of sinking through the diabase and prospecting the lower contact. This necessitated the installation of heavier hoisting machinery and a large expenditure for sinking before the area to be prospected could even be reached. This required a large faith; but Mr. Culver had it, and he has recently had the satisfaction of cutting a silver vein carrying good silver values at a depth of 1,600 feet from the surface. This will give welcome encouragement to pioneer work and will doubtless induce owners of other properties in the vicinity to undertake some work which to this camp is deep mining.

## MINERAL PRODUCTION OF ONTARIO, 1916. (Extracts from a bulletin just published by the Ontario Bureau of Mines.)

### Summary of Mineral Production for 1916.

The following table, subject to revision, summarizes the mineral output of Ontario for 1916:

| Product.                                              | —1916—     |                     |
|-------------------------------------------------------|------------|---------------------|
|                                                       | Quantity.  | Value.              |
| <b>Metallic—</b>                                      |            |                     |
| Gold, oz. ....                                        | 497,830    | \$10,339,259        |
| Silver, oz. ....                                      | 19,874,970 | 12,622,849          |
| Copper ore, tons ....                                 | 858        | 24,638              |
| Copper (in matte) (a), tons.....                      | 22,430     | 8,299,051           |
| Nickel (in matte) (b), tons.....                      | 41,299     | 20,649,279          |
| Iron ore (exported), tons.....                        | 121,495    | .....               |
| Pig iron (c), tons.....                               | 118,165    | 1,646,010           |
| Cobalt ore, tons ....                                 | 337        | 75,195              |
| Cobalt (metallic), lbs.....                           | 328,563    | 288,614             |
| Cobalt oxide, lbs. ....                               | 691,681    | 473,713             |
| Nickel oxide, lbs. ....                               | 100,013    | 16,915              |
| Nickel (metallic), lbs. ....                          | 42,411     | 17,847              |
| Other nickel and cobalt compounds,<br>lbs. ....       | 350,831    | 60,956              |
| Molybdenite (concentrates), lbs...                    | 17,956     | 19,541              |
| Lead, lbs. ....                                       | 689,882    | 60,038              |
| <b>Metallic Totals</b> .....                          |            | <b>\$54,936,605</b> |
| <b>Non-Metallic—</b>                                  |            |                     |
| Arsenic (white and other forms),<br>lbs. ....         | 4,320,890  | \$ 200,103          |
| Asbestos, lbs. ....                                   | 500        | 100                 |
| Brick (fancy, pressed and paving),<br>M. ....         | 31,742     | 318,942             |
| Brick (common), M.....                                | 58,541     | 498,896             |
| Tile (drain), M.....                                  | 16,562     | 302,080             |
| Tile (porous fireproofing) (d), M.                    | 4,451      | 176,953             |
| Cement (Portland), bbls. ....                         | 2,143,949  | 2,242,433           |
| Corundum, tons ....                                   | 67         | 8,763               |
| Feldspar, tons ....                                   | 12,965     | 42,159              |
| Fluorspar, tons ....                                  | 1,283      | 42,159              |
| Graphite (refined), tons ....                         | 3,446      | 249,586             |
| Gypsum (crushed, ground and cal-<br>cined), tons .... | 36,668     | 116,206             |
| Iron pyrites, tons ....                               | 175,508    | 471,555             |
| Lime, bushels ....                                    | 1,367,005  | 243,942             |
| Mica, tons ....                                       | 266        | 55,407              |
| Natural gas, M cu. ft.....                            | 16,767,910 | 2,235,513           |
| Petroleum (crude), Imp. gals....                      | 6,890,681  | 387,846             |
| Pottery. ....                                         | .....      | 42,025              |
| Quartz, tons ....                                     | 94,267     | 158,583             |
| Salt, tons ....                                       | 128,495    | 698,835             |
| Sand and gravel, cu. yds.....                         | 1,129,189  | 407,438             |
| Sewer pipe ....                                       | .....      | 216,749             |
| Stone (building, trap, granite, etc.)                 | .....      | 711,243             |
| Talc (crude and ground), tons....                     | 11,810     | 111,489             |
| <b>Non-Metallic Total</b> .....                       |            | <b>\$9,906,992</b>  |
| <b>Add Metallic Total</b> .....                       |            | <b>54,936,605</b>   |
|                                                       |            | <b>\$64,843,597</b> |

(a) Copper in the matte valued at 18c per lb.

(b) Nickel in the matte valued at 25c per lb.

(c) Production from Ontario iron ore only.

(d) Included in 1915 with fancy, pressed and paving brick.



A considerable expansion took place in the production of minerals in Ontario last year, particularly in gold, nickel, copper, cobalt, molybdenum, pig iron and lead. This was in large part a result of the war and consequent high prices for metals. The increase in valuation over 1915 is confined to metallic products, the total for non-metallies showing a small decrease.

#### Gold.

In 1916 there was produced 497,830 ounces of gold worth \$10,339,259, an increase over 1915 of 86,242 ounces or \$1,837,868. The production according to camps is appended herewith:

|                         | Tons Milled. | Gold, oz. | Value.       | Recovery<br>per ton. |
|-------------------------|--------------|-----------|--------------|----------------------|
| Porcupine. . . . .      | 1,330,562    | 452,095   | \$9,397,536  | \$7.06               |
| Kirkland Lake. . . . .  | 39,865       | 33,991    | 702,761      | 17.63                |
| Munro Township. . . . . | 477          | 2,495     | 51,578       | 108.13               |
| Long Lake. . . . .      | 26,847       | 9,236     | 187,003      | 6.97                 |
| Dryden. . . . .         |              | 6         | 130          | ....                 |
| Copper Ores. . . . .    |              | 13        | 251          | ....                 |
| Total. . . . .          | 1,397,751    | 497,836   | \$10,839,259 |                      |

In addition to the gold production, 91,872 oz. of silver were recovered, worth \$60,118.

The chief producers are given in the following table:

| Mine.                           | Ore Milled,<br>tons. | Gold,<br>oz. | Value.      |
|---------------------------------|----------------------|--------------|-------------|
| Hollinger Consolidated. . . . . | 601,854              | 244,139      | \$5,046,652 |
| Dome Mines. . . . .             | 444,900              | 103,809      | 2,142,939   |
| McIntyre-Porcupine. . . . .     | 120,191              | 46,744       | 1,022,999   |
| Tough-Oakes. . . . .            | 39,865               | 33,991       | 702,761     |
| Porcupine-Crown. . . . .        | 51,273               | 27,877       | 575,725     |
| Schumacher. . . . .             | 46,463               | 10,844       | 224,157     |
| McIntyre-Jupiter. . . . .       | 15,484               | 8,710        | 180,044     |
| Porcupine-Vipond. . . . .       | 43,041               | 8,508        | 175,874     |

Other producers were Dome Lake, McIntyre-Extension, Canadian Exploration Company at Long Lake, near Sudbury, Croesus in Munro Township, and a small shipment from the Rognon, near Dryden.

The new gold camps at Boston Creek and Kowkash are giving good promise under the development now going on. Gold has also been found in Cairo, Powell and Alma Townships, an area lying about twenty miles to the north of Elk Lake. The pre-Cambrian formations of Northern Ontario offer prospectors as good inducements as any part of the continent, especially for gold.

The aggregate value of gold produced in Ontario to December 31st, 1916, has reached \$33,663,648.

#### Silver.

During 1916 the total shipments of silver amounted to 19,874,971 fine oz., of which 91,872 oz. were recovered from auriferous ores, and 299 oz. from copper ores. As compared with 1915, the output shows a decrease of 4,871,563 oz., or nearly 20 per cent. Notwithstanding this the valuation exceeds that of last year.

The return to the mining companies was \$12,622,849 or an average of 63.511 cents per oz. High prices for the metal have stimulated production, despite the labor shortage and high cost of materials incident to the war. The average New York price for the year was 65.661 cents per oz. as compared with 49.69 cents in 1915. The lowest figure in 1916 was 55 7-8 cents and the highest 77 1-4 cents. As pointed out in last year's bulletin the enhanced price of the metal is due chiefly to the great demand from belligerent countries where silver is being coined at an increased rate to

replace gold withdrawn from circulation.

The production according to camps was as follows:

|                                                        | Oz.        | Value.       |
|--------------------------------------------------------|------------|--------------|
| Cobalt, including Casey Township. . . . .              | 19,414,500 | \$12,302,183 |
| South Lorrain. . . . .                                 | 7,629      | 5,020        |
| Gowganda. . . . .                                      | 360,670    | 236,817      |
| Silver recovered from gold and copper<br>ores. . . . . | 92,171     | 60,346       |
| Total. . . . .                                         | 19,874,970 | \$12,622,849 |

Shipments of ore and concentrates from Cobalt to refineries in the United States contained less than two million oz., the bulk of the output being treated in the mills, concentrators and reduction works at Cobalt, or in the refineries located at Deloro, Thorold and Welland.

|                       | Oz.        | Value.       |
|-----------------------|------------|--------------|
| Ore. . . . .          | 7,179,159  | \$4,155,574  |
| Concentrates. . . . . | 7,629,350  | 4,945,778    |
| Bullion. . . . .      | 4,974,290  | 3,461,151    |
| Total. . . . .        | 19,782,799 | \$12,562,503 |

Shipments made in 1916 were not all marketed, but in cases where bullion was stored, for instance, in New York, the average price of the metal for the year has been taken as a basis of computation, and the ounces and value included in the total shipments.

Since the discovery of silver at Cobalt in 1903 the total shipments from the camp and outlying silver areas have been as follows:

| Year.                 | Oz.         | Value.        |
|-----------------------|-------------|---------------|
| 1904 to 1915. . . . . | 235,407,189 | \$123,186,373 |
| 1916. . . . .         | 19,874,971  | 12,622,849    |
| Total. . . . .        | 255,282,160 | \$135,809,222 |

#### Nickel and Copper.

The production of nickel-copper matte at the Copper Cliff and Coniston smelters again shows a large increase. Figures for 1916 are 80,010 tons as compared with 67,703 tons in 1915, and 57,150 tons in the pre-war year of 1913. As in 1915, the producers were the Canadian Copper Company and the Mond Nickel Company. Ore smelted in the year amounted to 1,521,689 tons. The nickel and copper contents of the matte produced were 41,299 and 22,430 tons respectively. Metallic nickel produced from cobalt ores, and shipped by the Deloro Smelting and Refining Company amounted to 42,411 pounds, and was marketed at a price of 42 cents per pound. The chief shipments of copper ore in 1916 were from the Tip Top mine, west of Port Arthur, and the Mine Centre Copper Company, Rainy River district, the price received averaging 25 cents per pound. The Massey mine was also a producer. New York prices for copper averaged 27.20 cents per pound. Shipments of copper ore from Bruce Mines and the Howland mine to the Mond Nickel Company are included in the nickel-copper figures.

In the Township of Falconbridge, concession V., lots 10-12, the E. J. Longyear Company has discovered by diamond drilling a large pyrrhotite ore body. An overburden averaging 100 ft. in thickness had to be penetrated before bed rock was reached. The British America Nickel Corporation, which is controlled and partly financed by the Imperial Government, have broken ground for a smelter at Murray mine. Already the refinery of the International Nickel Company at Port Colborne is well under way.



# NOTES ON METALLURGY AT COBALT DURING 1916

By R. B. Watson.

## The Flotation Process.

The outstanding development in the metallurgy of Cobalt ores in 1916 was the largely increased use of the flotation process. Plants are now in operation or in course of construction at the Buffalo, McKinley-Darragh, Dominion Reduction, Coniagas, Beaver, Trethewey, Northern Customs Concentrator, National and Nipissing.

Notwithstanding the uncertain situation as regards the patents controlling this process in Canada, most of the mills have gone ahead with the installation of a few cells to treat the slime resulting from the original crushing, and some companies have more ambitious plans in view. The Buffalo company has the largest plant of this kind, one rated at 600 tons per day. In it the large pile of concentrator tailing will be reground in tube mills and subjected to flotation, along with the current production of mine ore. For the most part, however, flotation is confined to the treatment of the very fine material which formerly went to the slime tables. On this material, which runs about 6 oz. to 8 oz., the slime tables made a very poor extraction. By the new process, the tailing can be reduced to 1 oz. to 2 oz., or even lower.

## Equipment for Flotation.

The equipment necessary to float the regular concentrator slime is cheap, and the feed comparatively rich, so a good profit results. The next step will be more costly; that is, the reerushing of the sand table tailing in tube mills, followed by flotation. This requires a more expensive installation; the working cost will be higher; and the feed will average much lower—probably around 3 oz. The profit on this product will, therefore, be much less; but with the present high price of silver, the balance should be on the right side.

The Callow pneumatic cell is used generally throughout the district. Its simplicity and low working cost recommend it.

Machines of the impeller type have not been given much of a trial, though there are several Groch machines working, or being installed. The Kraut-Kolberg machine has also been tried.

The Callow cell has acquired many frills depending on the ideas of the mill man. Transverse baffles reaching to within two or three inches of the bottom prevent surging. In several mills the froth is allowed to overflow only at the tailing end of the cell; in another the froth is at four different levels in the cell and cascades over the baffles from one compartment to the other, finally overflowing at the feed end. These two devices raise the grade of the concentrate on this ore. Whether they will result in a higher tailing remains to be seen.

## Flotation After Cyanidation.

While flotation of the tailing from water concentration gives a good extraction, the flotation of the residue after cyanide treatment is another matter. A great amount of experimenting has been carried out at the Nipissing to solve this problem. Many variations of oil, tonnage, dilution, temperature and the addition of various chemicals have been tried; but the result on this particular ore is still far from satisfactory. It

was thought that the presence of .04 per cent. cyanide and .03 per cent. alkali in the pulp solution was the cause of the poor extraction. This was remedied by killing the cyanide and alkali with acid; but the results were no better. The fact that the ore must be ground to pass a 200-mesh screen in order to make a good saving by cyanide, probably interferes with the flotation treatment, as the very fine slime is carried up with the froth. The most likely explanation, however, is that the cyanide treatment changes the surface of the mineral particles to such an extent that these particles do not readily float.

In the past the cyaniding of Cobalt ores even with its higher cost has been more economical than water concentration. A number of companies with concentrators already built added cyanide installations for the treatment of the slime. Now with the high cost of cyanide and other chemicals, and with the advent of flotation, there is not much to choose between the two methods of treatment. It looks as if a 1-oz. tailing would soon be an accomplished fact.

## Treatment of the Flotation Concentrate.

The main objection to flotation in Cobalt is the cost of marketing the concentrate. At the present time there is only one smelting concern in Canada or the United States known to the writer which will buy this product. Such a situation is disquieting, to say the least. The cost of marketing 100 oz. concentrate with silver at 75c per oz. is 34 per cent. of the gross value. The marketing costs on 200, 300 and 400 oz. concentrates are 22 per cent., 16 per cent., 13 per cent. Every effort is being made at present to perfect a process for the economical treatment of flotation concentrate on the ground, and thereby save the high transportation cost.

Mr. Hugh Rose, in an article on the Santa Gertrudis practice states that the flotation concentrate from that silver ore can be treated raw by cyanide with a resulting high extraction. The same treatment on Cobalt concentrate gives very poor results and it becomes necessary to roast with salt before attempting to leach. If a good chloridization can be had, there should be little difficulty in extracting the silver by cyanide or by hyposulphite of soda.

In roasting this concentrate with salt, high volatilization losses occur in some instances. The dust loss on this very fine material is also an item. The Holt-Bern furnace has been suggested for this work, and one will shortly be built at the Buffalo. This furnace is used on silver ores at Tintie, Utah. Its construction resembles that of a lime kiln, and it has no moving parts. The ore is mixed with 5 per cent. sulphur in the form of pyrite, or with coal, and is charged wet into the furnace. A fire underneath starts the operation and air blown through the charge keeps it going with the fuel in the mixture. The top of the charge being wet prevents volatilization and dust losses.

## The Buffalo Process of Treating the Flotation Product.

Mr. T. R. Jones at the Buffalo has just completed a plant for the treatment of this flotation product. The concentrate is pumped to a thickener that feeds an Oliver filter, where it is dewatered. The necessary salt is added in solution to the cake before it is scraped



from the drum of the filter. The concentrate is then dried in an oil fired revolving cylinder, and, after crushing, is fed to a hearth furnace to be replaced later by the Holt-Dern.

The calcine is pulverized in a Hardinge ball mill, mixed with an acid solution to dissolve the oxidized copper, and then drawn on the leaves of a Moore filter. Subsequently the leaves carrying the pulp are immersed in a caustic soda solution to neutralize the remaining acid and are then transferred to the tank containing cyanide. Most of the silver is extracted in the short treatment on the filter leaves. The residue is then pumped to the cyanide tanks, where it receives further treatment and then goes to flotation.

#### **A New Process for Treating High Grade Ore and Concentrate.**

During the past year, a new plant has been built by the Cobalt Reduction Co. for the treatment, by a new process, of high grade ore, and concentrate. This method was worked out by Mr. M. F. Fairlie, who has demonstrated that after a preliminary treatment with bleaching powder,  $\text{Ca}(\text{OCl})_2$ , this refractory combination of minerals can be successfully cyanided. The low-grade ore is concentrated in the usual way on tables, the slime going direct to a cyanide annex. The table concentrate is reconcentrated on tables and brought up to 2,000 oz., while the tailing from this treatment is sent to the cyanide plant with the slime. The rich concentrate, together with the high grade ore, is then ground wet for 24 hours in a tube mill equipped with iron linings and balls. To this charge is added, toward the end of the operation, 2 per cent. bleaching powder. The effect of the bleaching powder is to oxidize the refractory silver minerals and make them amenable to treatment by cyanide.

The charge from the tube mill goes to a Dorr classifier, where the coarse material, including the metallies from the ore, is removed. The pulp after being well washed, is dewatered by an Oliver filter; the treatment by a strong cyanide solution follows. The final residue after filtration on another Oliver filter, can be readily marketed for its cobalt and silver content.

The silver-bearing solution is precipitated by sodium sulphide, the resulting precipitate being desulphurized in a small tube-mill by the aid of metallic aluminum and a caustic soda solution. The silver is then melted down to fine bullion in a hearth furnace. (This method of precipitation was first installed in Cobalt at the Nipissing and has been described elsewhere)\* The oversize raked out by the classifier is given a partial roast on the hearth of the furnace to eliminate part of the arsenic and is then melted down to bullion. The small amount of speiss and slag is returned to the tube mill with the next charge. By this simple but ingenious process the corporation which was formerly one of the largest shippers of ore and concentrate in the district is enabled to market practically its entire production in the form of fine silver bars.

#### **GEOLOGICAL SURVEY PUBLICATIONS.**

Three reports just issued by the Geological Survey are: Memoir 89, Wood Mountain-Willowbunch Coal Area, Saskatchewan by Bruce Rose; Memoir 92, part of the district of Lake St. John, Quebec, by John A. Dresser; Memoir 95, Onaping Map-Area, by W. H. Collins.

The area reported on by Mr. Collins included the West Shiningtree gold deposits.

#### **CONCENTRATING COBALT SILVER ORES BY FLOTATION.**

The following notes on flotation of silver ores are from a paper to be presented at the annual meeting of the Canadian Mining Institute, March 6, by J. M. Callow and E. B. Thornhill:

Practically all the flotation plants at Cobalt are using an oil mixture consisting of pine oil, coal tar creosote and coal tar. A mixture of 15 per cent. pine oil, 75 per cent. coal tar creosote and 10 per cent. coal tar is very efficient. A 10 per cent. pine oil and 90 per cent. high sulphur fuel oil mixture is being used to float cyanide plant tailings with fairly good results.

Recoveries by flotation vary over a rather wide range at the different plants, depending on the product going to flotation, the grade of concentrate required and the experience of the operator. The last factor is probably the most important at the present time, as some time is required to produce an efficient operator.

Due to the present excessive marketing charges it is economy to sacrifice recovery to some extent in order to produce a high-grade concentrate.

This marketing charge, representing 20 per cent. of the gross value of the product, has led to considerable research work by the metallurgists of the district to devise a satisfactory method for the local treatment of such concentrates.

A chloridizing roast followed by leaching either with cyanide or an acid brine solution has given the best results to date. In fact, the Buffalo mines is now treating five to six tons flotation concentrate daily by a chloridizing roast followed by an acid leach to extract the base metals and then by cyanide leach to recover the silver chloride. A 95 to 98 per cent. extraction of the silver values has been obtained with this method.

Some research work has been done to determine the amenability to recovery by flotation of the particular silver minerals that occur in this district. These tests were carried out by mixing finely ground picked specimens of the particular mineral with a practically barren gangue and the mixture floated.



A. A. Cole, Cobalt, re-elected president Canadian Mining Institute.



R. B. Watson, general manager Nipissing Mining Co.



A. R. Globe, assistant manager Hollinger Consolidated Gold Mines.



G. C. Bateman, manager La Rose Consolidated Mines.



C. A. O'Connell, manager Tough-Oakes Gold Mines.



### THE KIRKLAND LAKE DISTRICT.

The first discovery of ore made in the Kirkland Lake District was on the Wright-Hargreaves property in 1910, and shortly afterwards some drilling was done there with a McKernan-Terry shot drill. Owing to the extreme hardness of the feldspar porphyry the work was abandoned after two shallow holes were put down.

Work on the Tough-Oakes group was started in the summer of 1912 and following this the Teek-Hughes, Lake Shore and other properties were opened up.

The engineers who examined the various properties after the first ore was uncovered were doubtful of their prospective value, owing to the fact that for the most part the veins were narrow and the enclosing rocks showed low gold content on both sides of the outcrop.

The majority of the veins have an East-West Strike, and dip South at an angle of from 54 to 74 deg. The width at outcrops varies from 3 inches to 24 inches. Outcrops show considerable free gold in places. A number of tellurides have been found in the ores of the district, and of these altaite, or telluride of lead, is the predominating one. This occurs both in the vein quartz and also in the enclosing wall rocks and is usually associated with the very rich ore. Calaverite (Au-Te) and other gold-silver tellurides have also been found in the veins, but in lesser quantities than altaite.

There have been several periods of redeposition, and in places the vein quartz is much brecciated and recemented with a later quartz filling. Frequently calcite is found on the hanging wall side of the veins and



Tough-Oakes Mill, Kirkland Lake, showing ball and pebble mills.

In many ways the veins in the Kirkland Lake District show a marked similarity to those of Cobalt, inasmuch as they present a narrow width of high grade ore at outcrop, and this with the gold content of the enclosing wall rocks admit of stoping widths of from 48 to 72 inches.

The Report of the Bureau of Mines issued in 1914 set at rest any doubt as to the value of the deposits. This work was done by A. G. Burrows, assisted by P. E. Hopkins, and was accompanied by a Geological Map which is a model of accuracy.

The work on the Tough-Oakes property proved that the bulk of the ore was in the feldspar porphyry, and the indications were that considerable depth of payable ore would be obtained. This property is the senior mine in the district. To the end of 1916 about 70,000 tons of ore has been milled.

some of this contains much coarse gold. The wall rocks show the result of much folding and the fractures have been filled with narrow quartz stringers containing gold and the sulphides of copper and iron. In all of the veins there is present molybdenite in the form of thin films, some of which are slickensided as a result of the folding. Some of the vein quartz shows a thin film of gold on the slickensides, and presents a very attractive appearance.

The bulk of the ore in the district is found in the feldspar porphyry, and to date only a small amount into Kirkland Lake is urgent and as the amount of freight received at Swastika is increasing every month, the congestion at that point is at times very great.

In order to assure an ample supply of electric power for the district the Northern Ontario Light and Power Co., of Cobalt, have built a very substantial, three



phase, 44,000 volt, line from their sub-station at Cobalt to Kirkland Lake. At the terminal they have erected a large reinforced concrete sub-station where the power will be stepped down to 2,200 volts, and delivered to has been mined from the veins where they are in the Temiskaming series of the conglomerate and grey-wacke. Although most of the veins are narrow they all show continuity, and there is every reason to believe that they will persist to a considerable depth.

Since the summer of 1916 there has been a great increase in the number of properties being developed, and it is very probable that before the end of another year there will be six or eight proven mines in the Kirkland Lake Section.

The need for a branch of the T. & N. O. Railway the various mines within a two mile radius. The Touch-Oakes company have been receiving their power for the past three years from the Farah Hydro Electric Plant at Charlton 26 miles South to Kirkland Lake. The supply has not been adequate for some time and when the power from Cobalt is available a much larger amount of development work can be carried on at all the mines in the District.

The results of the development carried on during the past four years have demonstrated that the future of the Kirkland Lake District is assured, and the present year should be one of great progress.

#### MILLERTON AND ACME.

The Millerton and Acme properties were merged with the Hollinger in 1916. Commenting on the work done on these properties during 1916 Manager Robbins says:

"A limited amount of work has been done upon the Millerton at three points. No. 8 shaft near the south boundary of the north claim was deepened and in the course of the work a vein 4 feet wide, assaying about \$15 per ton, was passed through. Shortage of labor caused work in this shaft to be suspended. On the 200 ft. level vein No. 13 was followed into Millerton ground, yielding from \$12 to \$15 per ton. On the same level a crosscut was driven east from No. 7 shaft to tap vein 226, which was found to run from \$25 to \$30 per ton where encountered.

"The Acme has come up to all expectations and is demonstrating the assumption that its potential value is much greater than the value indicated by developed ore, for work at shafts 9 and 11 has proved that a number of the veins extend beyond the limits previously ascribed to them, while several new ore bodies have been encountered."



Sketch map showing Tisdale and neighboring townships.

#### ONTARIO'S RICHEST GOLD DEPOSIT.

During the past few years Ontario has, thanks to the Poreupine and Kirkland Lake districts, become an important producer of gold. In the Hollinger and Dome mines the province has two of the largest gold producers in America.

Less well known outside of Northern Ontario is the wonderful Croesus mine in Munro Township, twelve miles from Matheson on the T. & N. O. Railway. Here some of the richest ore ever mined is being taken out.

On the front cover of this issue of The Canadian Mining Journal we reproduce in colors a specimen of rich ore from the Croesus. This specimen is shown natural size. The drill mark in the upper right corner shows how the drill holes are in places almost lined with gold. The specimen is, by weight, over one-third gold.

On the opposite page we reproduce photographs of five pieces of Croesus ore. These are shown considerably reduced in size. The specimen shown on the cover in natural size and color is shown here again and may be recognized by the drill hole. Comparison of these photographs with the colored reproduction will give some idea of the size and gold content of the pieces of ore.

These five pieces of ore have been purchased by the Ontario Bureau of Mines and have been carefully weighed. They together weigh 38,689 grams and contain 16,431 grams gold and silver. This is equivalent to 528.28 oz. gold and silver, of which 480.7 oz. is gold and 47.5 oz. is silver. The value of the gold and silver in the five pieces, which together weigh about 85 lb., is therefore about \$9,966.

It is not to be imagined that all of the Croesus ore is like these specimens, for the deposits are very pockety. There is, however, a considerable quantity of such rich ore in the vein.

The vein has an average width of 3 ft., and there are values in the wall rock for one foot on each side of the vein. In places serpentine bands cross the vein.

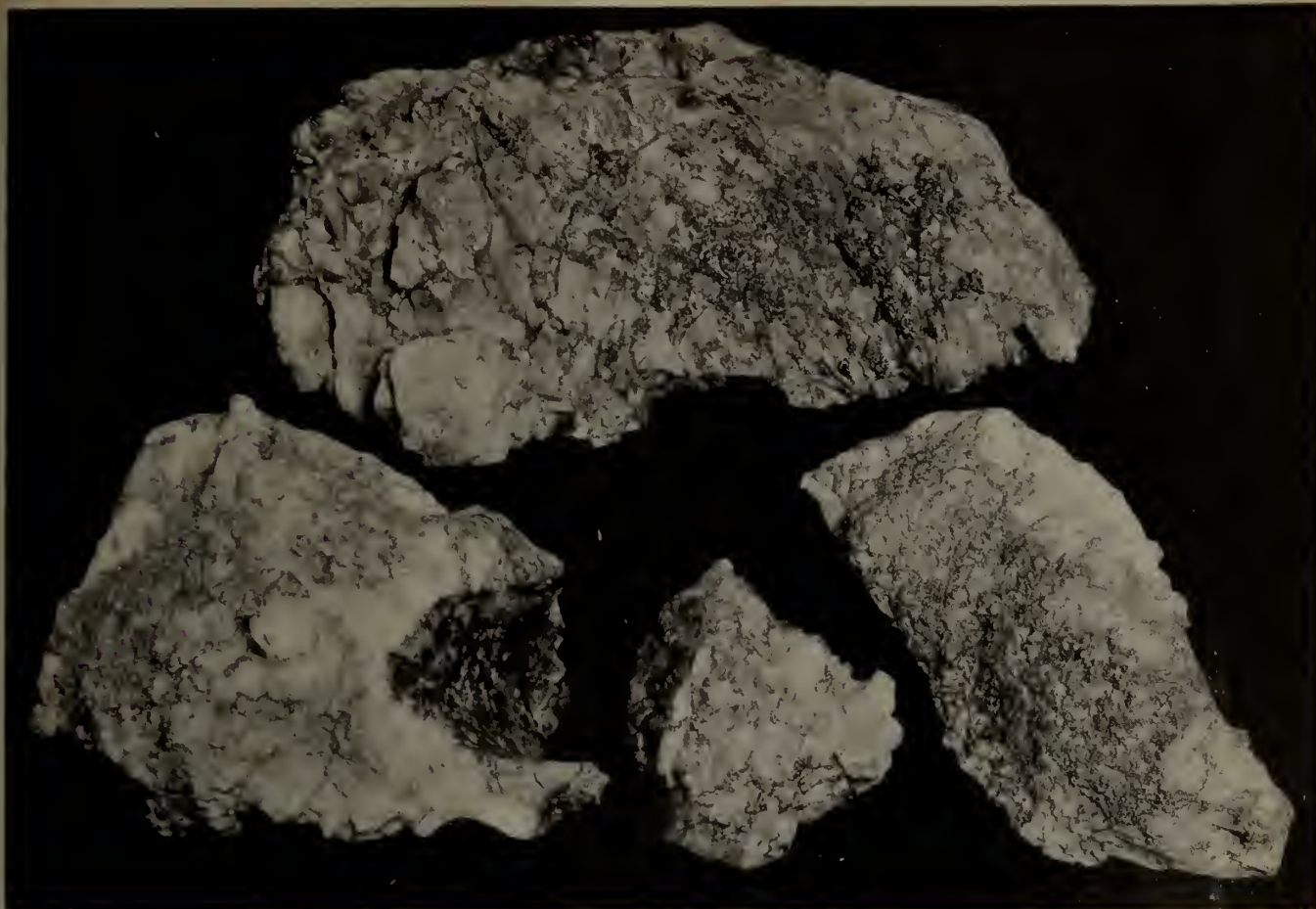
The vein strikes north and south and dips east at an angle of 26 deg. A shaft was put down on the vein to the 300-ft. level and from there to the 400-ft. at an angle of 40 deg. Levels are being extended at 100, 150, 200 and 300-ft. On July 29, 1916, the plant was totally destroyed in the disastrous forest fire. It has since been rebuilt and mining has been resumed.

The property now known as the Croesus was for some time known as the Dobie-Leyson claim. It was considered a good prospect; but little work was done on it until the Dominion Reduction Company acquired the property and began development work in 1915. The results were phenomenal. A shaft was sunk on the vein and from this shaft above the 100-ft. level \$120,000 in gold was taken out in sinking operations. In a few months about \$1,000,000 worth of ore was partially developed with a small prospecting outfit.

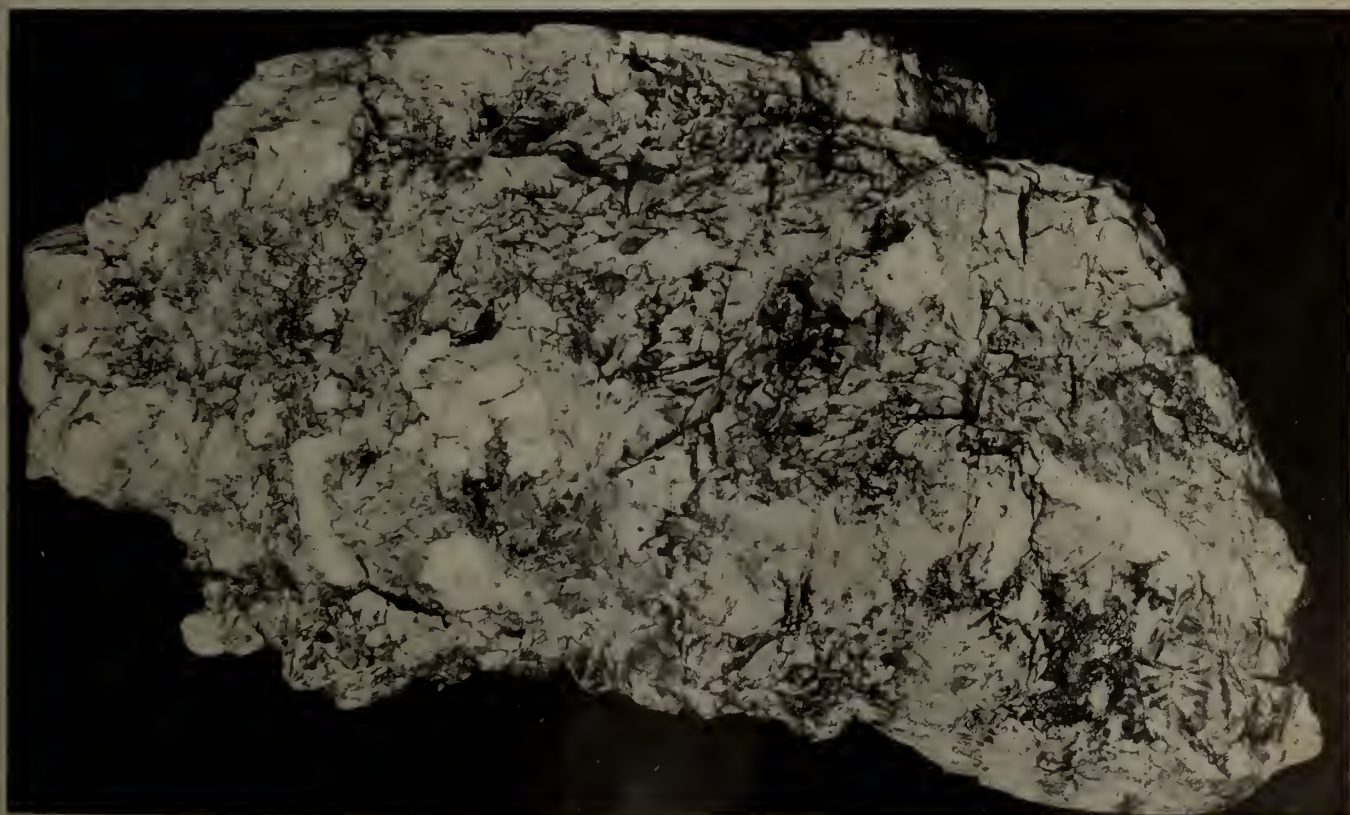
The high-grade ore mined is reduced to bullion in an oil-burning furnace. The quartz remaining after the high-grade is picked out runs quite high. Mill tests on the decantation process show a 99 per cent. extraction.

Croesus Gold Mines, Ltd., is operated as a close corporation by the Dominion Reduction Company. The property consists of three claims, 120 acres. Mr. Julius M. Cohen is manager.





These 5 pieces of ore, shown about one-fifth natural size, contain 528.28 oz gold, or over 40 per cent. See opposite page and front cover.



Gold ore from Croesus Mine, Northern Ontario.  
These 5 pieces of ore weigh together 85 lb. and contain \$9,966 in gold and silver.





J. W. Morrison, manager Lake Shore Mines, Ltd.



Jos. C. Houston, general superintendent Dome Mines.



M. W. Summerhayes, manager Porcupine Crown Mines, Ltd.



W. E. Segsworth, managing director Seneca-Superior Silver Mines, Ltd.





Tom R. Jones, manager Buffalo Mines.



Julius M. Cohen, manager Croesus Gold Mines.



H. A. Kee, manager Kerr Lake Mining Co., Ltd.



J. A. McVichie, manager Chambers-Ferland Mining Co.

## INVESTMENT IN MINES

By J. B. Tyrrell.

It is quite probable that most of the people who buy shares in the stocks of mining companies do not care whether the mines are good or bad. Their money is put on the cards with certain mining names and they occasionally win, and often lose, with the rise and fall of the markets. The extraordinary feature of this game is that the more money the dealer collects in his pile, which of course is taken from them, and the richer he gets, the more confidence they have in him and the harder they play.

If it had been customary for the land to be tilled by agricultural companies incorporated under the Joint Stock Companies Act the names of such companies might have been substituted for those of mining companies, and any disrepute which might have been attached to the one name might have been transferred to the other. So that for any disrepute that the mining industry has, the Joint Stock Company's Act and not the mines are largely responsible.

I have nothing to say to such gamblers. They should be handed over to their clergymen for curative moral and religious treatment.

But there are men in the community who are interested in the development of the mining resources of the country, and who are prepared to follow their interest with some of their money. To such men a few remarks may be of interest.

First, let them disabuse their minds of the idea that mining is any sort of a game, to be played either over the table or out of doors. It is not an amusement or recreation or dishonest mode of making a living; but it is a serious calling and must be contemplated seriously if it is to be successful. The work may be pleasant or enjoyable as any good successful work should be, whether that work is mental or physical; but it is none the less strenuous on that account.

Everyone will of course recognize that the actual supervision and operation of mines is serious and strenuous work, but many think that the investment of money in these same mines is gaming. This may be true or untrue, just as one may see fit to make it.

If the purchaser is willing to take the trouble to be an investor, and not a gambler, in mining stocks he must exercise the ordinary precautions that he would take if he were to put his money into any other business enterprise. He must remember that a mine, in whatever stage of its development, is a natural feature which embraces a definite portion of the earth's crust, and that it can be examined and valued by those who are accustomed to perform such work, just as a house or garden or farm can be valued, and that the men who invest on the advice of such valuers are reasonably certain to make good profits on their investments.

Most men who buy stock in mining companies buy on the advice of men interested in selling stock to them. The sellers may be quite honest, and their opinions may be backed up by those of others who are also honest, but nevertheless it is the duty of an intelligent business man to inspect what he buys, or to get some competent person in whom he can place confidence to inspect it for him, whether the object is a mine, a timber limit, a farm, a horse, or whatever it may be. If he does not have such inspection made he

deserves to lose his money. Some people may argue that opportunities for good investments in mining properties are seldom offered, and when offered must be seized quickly or they will be snatched up by others. Take your time, and if a man tries to hurry you into a quick purchase without sufficient time for careful examination, no matter what pretext he may offer for the shortness of time at his disposal, refuse to do business with him; you will save money in the long run.

It may also be thought that it is almost impossible to make favorable investments in good mining properties or in stocks of good mining companies on account of the keen competition for such investments. But competition to be effective must be intelligent, and most of the so-called competition is neither the one nor the other. Uninformed buying is no competition to the careful business man; but on the contrary it often gives him an opportunity to secure bargains which he would not be able to get if other buyers were not wasting their money on trash. The purchaser of a mine or of mining stock, who purchases without knowledge or competent and independent advice is not a formidable competitor to the man who knows thoroughly what he is purchasing. In spite of the wails and protests of those who have lost money by buying pieces of paper which they were gullable enough to believe would soon represent wealth to be derived from new mines, I have no hesitation in saying that at the present time investments in mines, if made intelligently and on competent and independent advice, will yield larger and more certain returns than investment in any other class of securities on the market.

There may be some timid mining engineers who will say that they do not invest any money that they may possess in mining securities. Such engineers must be avoided as financial advisers. If they have not sufficient confidence in their knowledge and ability to separate good mines from bad ones, and to stake their own money on that knowledge, you may take it for granted that they are not capable of judging of the value of mines in which others should invest. But there are engineers who make a study of the value of mines, and who are not afraid to put their money into them. The advice of such men will usually lead to successful investments. It may have nothing to do with the vagaries of the stock market, and it is rarely that a purchaser will buy on such advice stock which is selling at \$2.00 to-day and which will be selling at \$4.00 to-morrow, but he will buy stock in mines which have intelligent, honest directors, are well managed, have large ore reserves, and are certain to pay good dividends for years to come.

If the capitalist has money to spare, and wishes to take long chances in the hope of larger returns, he may be directed to buy stock or interests in mining properties in their early stages of development which have good prospects of becoming dividend payers, and he will be directed to avoid the many properties, no matter how glaringly advertised, which have no such prospects. In the case of such speculative purchases no advising engineer of any reputation or standing will guarantee success, but he will increase the chances of success manyfold.

Such speculative purchases are the ones usually



thought of when men talk about "putting their money into mines," and the successes that have fallen to the lots of the fortunate speculators have laid the foundations for many an attractive story. If a man wishes to speculate, let him do so, but let him be sensible and reduce the chances against himself as much as possible before he pays over his money. He should not accept a seller's statement that a hole in the ground, whether large or small, is of any value as a mine until he has taken the trouble to examine it for himself or has had it examined by some competent and independent valuator.

I have attempted briefly to draw attention to an ordinary business principle in common use among people everywhere throughout the country. If it is kept as constantly in view when mines, or interests in mines, are being purchased, as it is in other commercial transactions, we will soon hear less of the losses incurred in the purchase of worthless mining stock.

#### DIVIDENDS PAID BY COBALT SILVER MINING COMPANIES.

To December 31, 1916.

|                                |            |
|--------------------------------|------------|
| Beaver . . . . .               | \$ 650,000 |
| Buffalo . . . . .              | 2,787,000  |
| Caribou . . . . .              | 225,000    |
| Casey Cobalt . . . . .         | 203,249    |
| City of Cobalt . . . . .       | 139,321    |
| Cobalt Central . . . . .       | 192,845    |
| Cobalt Comet . . . . .         | 229,700    |
| Cobalt Lake . . . . .          | 465,000    |
| Cobalt Townsite . . . . .      | 966,726    |
| Coniagas . . . . .             | 8,440,000  |
| Crown Reserve . . . . .        | 6,102,399  |
| Foster . . . . .               | 45,774     |
| Hudson Bay . . . . .           | 1,940,250  |
| Kerr Lake . . . . .            | 6,570,000  |
| La Rose . . . . .              | 6,887,708  |
| Mining Corporation . . . . .   | 1,348,750  |
| McKinley . . . . .             | 4,809,044  |
| Nipissing . . . . .            | 15,340,000 |
| Penn. Canadian . . . . .       | 67,485     |
| Peterson Lake . . . . .        | 420,318    |
| Right of Way . . . . .         | 573,036    |
| Seneca Superior . . . . .      | 1,579,817  |
| Silver Queen . . . . .         | 315,000    |
| Temiskaming . . . . .          | 1,684,156  |
| Trethewey . . . . .            | 1,111,999  |
| Wettlanfer . . . . .           | 637,466    |
| Private Corporations . . . . . | 3,825,000  |

#### HAS PRODUCED \$15,466,444 GOLD.

Hollinger, Aeme and the consolidated company, Hollinger Consolidated, produced to Dec. 31, 1916, \$15,466,444 and paid in dividends \$7,456,000. The deposits were discovered in 1909 and production began in 1911. The Hollinger output in 1911 was \$46,082.

#### \$1,200,000 FOR SUPPLIES.

Hollinger Gold Mines, Limited, is a big consumer as well as a producer. During 1916 Hollinger used in operations alone \$800,000 worth of supplies, \$400,000 was used in construction work during the same period.

#### THE HOLLINGER IN 1916.

In spite of increased cost of supplies, delays in shipments of machinery and shortage of labor, the Hollinger mine produced in 1916 \$5,073,401, as compared with \$4,205,901 in 1915.

The increase is not as great as was expected a year ago, and present production is not what it would have been under normal conditions. When the adverse circumstances are taken into account the production of \$5,073,401 at a profit of nearly \$2,866,984 is a creditable one. Unfortunately, however, development work has of necessity been somewhat neglected, and it is said that labor agitators are taking advantage of the shortage of labor to spread unrest among the men.

Regarding the shortage of labor and the increasing cost of materials and supplies the President, N. A. Timmins, states in a recent report to shareholders that gold, having a fixed valuation, can be produced at a much less cost after the war than at present. There is, in his opinion, no reason why the Hollinger company should enter into undue competition with other industries or with the enlistment of men for the army to secure an adequate supply of labor.

"One year ago," says the President, "we believed that we would not only be able to keep up our output, but to increase it materially; and we expected that by the time the new addition to the mill would be completed the scarcity of labor would be relieved. That we did succeed in increasing our output is a matter of record, and if we could feel absolutely sure that conditions in the matters especially of labor and supplies would not become worse we would be inclined to continue our present policy.

"In view of the situation we have decided that under prevailing conditions it is in the best interests of the shareholders to conserve the company's assets and properties rather than to continue to disburse the amount now being distributed every four weeks. Whether this will be done by maintaining the present dividend rate of 1 per cent., with less frequent distributions, or by reducing the rate by one-half, will be announced at the annual meeting. The directors regard any change in the dividend as merely temporary, and shareholders may rest assured that the dividends will be increased as soon as conditions warrant it. We expect to operate for many years to come, and consider our action in regard to the dividend not as a setback, but merely a delay in our program of expansion. Meanwhile it is the intention to operate the mine and the mill to the fullest capacity possible consistent with present conditions, and we will continue to make as large profits as possible."

"During 1916 dividends amounting to \$3,126,000 were distributed among shareholders, thus causing a deficit from operations of \$119,590, to which is added \$150,000 written off for plant depreciation.

"The deficit is largely technical," says the President, "and so small in comparison with our total operations that it has no real significance and will be readily made up once normal economic conditions are restored."

#### Ore Reserves.

Managing Director P. A. Robbins estimates the Hollinger ore reserves at 3,938,000 tons of ore of an average value of \$8.68 per ton. The estimated gross value of the ore reserves on December 31, 1916, was \$34,185,000, as against \$33,837,000 on December 31, 1915. Mr. Robbins states that "ore reserves have been estimated upon the same basis as previously, although they are



somewhat more conservative in that certain doubtful valuations have been eliminated. In spite of greatly curtailed development we still show approximately the same reserves as we did in last year's report, and during the interval there has been removed from the mine 604,062 tons, containing \$5,342,234.77, an average of \$8.84 per ton.

"In estimating the reserves we use the actual measurements of the ore in place, but when the ore is mined it is not possible to prevent a certain amount of waste rock from being broken and becoming intermingled with the ore. This dilution with waste has the effect of lowering the value per ton of the mixture, although it increases the number of tons. Our experience, after five years of operations, has been that there is a dilution of approximately 10 per cent., and hence the present estimate of \$3,938,540 tons at \$8.68 per ton will, when milled, probably yield approximately 4,300,000 tons, averaging about \$7.75 per ton.

"It gives me pleasure to report that all of our underground developments have been highly favorable, and once normal conditions of labor are restored there can be no doubt but that developments will continue to show increases in total values of ore beyond those contained in the present estimates."

In his general remarks Mr. Robbins mentions the fact that during the year 1916 there was expended upon capital account a total of \$725,000 in opening up the mine and increasing the plant to permit of mining and milling 3,500 tons of ore daily. In 1916 the company produced the sum of \$5,073,000 at a profit of nearly \$3,000,000, and, while the Managing Director states that it falls short of his expectations, it is, nevertheless, a new record in Canadian gold mining operations. In regard to the hitches which have occurred in the amalgamation program Mr. Robbins states: "The amalgamation was planned at the end of 1915, and it was anticipated that by the first of April, 1916, it would be an accomplished fact. Unfortunately for our plans, the resolution proposing the Dominion war profits tax was not understood, and the first interpretation led to a belief that we should be placed in an awkward financial predicament if the proposed amalgamation were gone ahead with. Consequently the matter was delayed until the meaning of the act was better understood, and as a result the actual amalgamation of the properties was not consummated until June.

"Long delays in the delivery of machinery and parts held up the completion of the addition to the mill, so that, instead of April, it was September before we were able to treat the tonnage required by our plans. The knowledge that there has been a shortage of labor has naturally resulted in diminishing efforts upon the part of many workers, and while various expedients have been tried in an endeavor to overcome this tendency, the results have not been a marked success.

"Labor agitators and organizers have succeeded in spreading considerable unrest among the men, but it is to be hoped that their efforts to precipitate a strike will be unsuccessful. Under present conditions there would be nothing for us to do but curtail our operations.

"The shortage of labor has somewhat affected the grade of ore produced, for instead of developing and mining the better grades of ore, it has been advisable to mine such ore as could be most readily extracted."

Total costs including all mining, milling, etc., amount to \$2,428,601, or at the rate of \$4.033 per ton, as compared with \$3.982 in 1915.

In the matter of costs the report says: A continual advance in the cost of supplies, and the growing shortage and the lowering quality of labor has increased the costs of operation, until they are approximately 50 cents per ton above normal, which means a reduction in profits of from \$900 to \$1,000 per day. Scarcity of labor has also prevented the aggressive development of higher grade ore bodies, and has made it necessary to mine and mill the ore most easily available.

Additions to plant and equipment during 1916 totaled \$599,417. Total development done was 20,280 feet.

## BRITISH COLUMBIA MINERAL PRODUCTION IN 1916.

A preliminary report, issued by the British Columbia Bureau of Mines, shows an estimated mineral production during 1916 of a value of \$42,970,555, an increase of 45.9 per cent. over 1915, and of 32.5 per cent. over the best previous year, 1912.

The output of copper for the year 1916 is estimated to have been about 67,757,075 lbs., which is about 19 per cent. greater than the previous year. The value of the product was \$18,429,924, an increase over last year of \$8,594,424, or 87 per cent., and amounts to about 56.3 per cent. of the value of the metallic minerals produced this year.

The combined rises in the prices of lead and silver very greatly helped the silver-lead mines of the Slocan. The provincial output of lead this past year is estimated to be about 52,242,183 lbs., worth \$3,186,773, and that of silver was 3,366,205 ozs., worth \$2,099,838.

Preliminary figures indicate that the output of zinc in 1916 was more than two and a half times what it was in 1915, the previous record year. Increased production has been nearly general in all the zinc-producing districts.



New head frame, Dome Mine.



## GOLD AND SILVER MINING IN NORTHERN ONTARIO—(RETROSPECTIVE AND PROSPECTIVE.)

By Homer L. Gibson.

Looking backward very little more than half a score of years, one can recall the time when precious metal mining in Ontario was regarded in the light of an extremely doubtful venture in which no practical or sensible person should engage. Then, any one daring to publicly express a belief that mining would ever contribute in more than a nominal degree to the prosperity of the province, was regarded in the light of a dreamer, to put it mildly.

One can also recall that at that time there were some grounds for such a feeling, as the earlier efforts to develop profitable mines resulted in disappointments, almost without exception. The history of the Rainy River and Lake of the Woods districts is not a particularly pleasant one to recall. In the light of later developments, however, it is not altogether certain whether the failure of those districts to make good the somewhat extravagant promises which were made concerning them, was due to lack of ore or lack of knowledge. That they did fail, though, is certain.

### Silver Mining at Cobalt.

In any event the real beginning of the evolution of precious metal mining in Ontario from the stage of doubtful venture to that of stable industry, dated with the discovery of silver at Cobalt.

Cobalt was, and is, unique in the mining world, and by that very fact attracted the attention of mining men the world over. The wonderful richness of its veins fairly dazzled their beholders, and to men of practical knowledge furnished the very reason why it could never take its place among the really great metal-producing districts of the world. That it has done so, however, cannot now be gainsaid, as witness its substantial dividend record of nearly \$70,000,000, and its total production figures of nearly \$150,000,000 in a little more than ten years.

Cobalt's past history can properly be divided into four stages, with a fifth just dawning. Each of these stages has witnessed changes in mining practice, each more scientific than the preceding one, and each made necessary by changes in conditions brought about gradually by the progress of underground development.

The first of these periods constituted what we may call the "high grade" days of the camp, during which the sole effort of the operators was concentrated on extraction and shipment of the wonderfully rich ores which occurred at or close to the surface. This was the period of \$10,000 ears, and of course was the boom period of the district. Then, no particular attention was paid to low grade wall rock values, which were consigned to the dumps with hardly a thought that they would in time furnish the mainstay of the camp's production.

The second period witnessed the introduction of concentration of the lower grade ores, aimed primarily at reduction of shipping charges. The noticeable difference between this period and the former one was in the decreasing tonnages of shipments to smelters, but an easy maintenance of earlier records as regards number of silver ounces handled.

In the third period, cyanidation of ores and the refining of a considerable part of the product to bullion form was inaugurated, bringing about further reductions in the tonnages of raw ores shipped.

The fourth and final period as regards Cobalt's past was that of oil-flotation. Properly speaking, this period cannot be considered as of the past, as it is of comparatively recent introduction and is of decided vogue at the moment. Its success has been fully demonstrated and it is gradually being made a part of the practice at all the plants in the camp.

By this method, ores formerly considered of entirely too low grade for profitable handling are being treated, and in several instances the old tailings dumps that had accumulated in past years of operation, are being re-handled at a decided profit. This profit has, of course, been materially enhanced by the high average price for silver metal that has prevailed for the past year or more. It can be safely said that this innovation bids fair to maintain the profitable life of the camp for many years.

The fifth period lies entirely in the future and has just been made probable by the definite location of values below the diabase sill which at one time must have covered the greater part of the district.

At the risk of appearing to be a wild theorist, the writer would suggest that many similar areas in the western part of Coleman Township and through the Elk Lake and Gowganda districts, offer decidedly attractive speculative possibilities to those with sufficient of that necessary combination of capital and courage, to sink through the diabase and explore the keewatin which probably underlies.

This theory does not seem any more unreasonable now than did that of F. L. Culver regarding Beaver and Temiskaming five or six years ago, particularly as the section referred to has numerous veins of consistent size and regularity, carrying the characteristic Cobalt minerals, but of low silver content.

To demonstrate the truth or falsity of such a theory is of course a matter of years, requiring the expenditure of very large sums of money, purely and simply as a venture. This only emphasizes the passing of the poor man's Cobalt and the actual beginning of a time in which the new chances will have to be taken by those who know Cobalt best, and by such knowledge are made willing to gamble large sums in the hope of the handsome reward that follows the location of high grade values. Such an idea may seem somewhat ridiculous just now, but it indeed presents an attractive picture.

### Porcupine Gold Mines.

Entirely aside from its own importance, to Cobalt can be laid the reason for the discovery of Northern Ontario's gold districts, of which at present Porcupine and Kirkland Lake are the shining lights. Their discovery is certainly the result of the prospector's search for other Cobalts and seems entirely incidental to the real reason underlying their efforts.

Fortunate in respect of having attracted the attention of real mining money and brains in its earliest days, Porcupine has been beset with many difficulties in its comparatively short life. First there was the handicap of lack of railway transportation, which for the first year and a half made the cost of development work almost prohibitive. When this was overcome by the construction in 1911 of the Porcupine branch of



the Temiskaming and Northern Ontario Railway, other camp, in that no change of geological formation or of vein occurrence takes place to depths of 2,000 feet or more. This is not a great depth as such are measured in some other mining districts, but it is conceded by geological authorities that it is reasonable to expect both veins and values to continue to the lowest possible depths for profitable mining.

The most encouraging feature of the whole situation is that both veins and values have been found to be more consistent in their occurrence below 500 feet depth than they are above. Many of the veins have been found to be severely faulted above the 500-ft. level and this has made necessary heavy expenditures in searching for "lost" veins above that level. The work that has now been done, however, has demonstrated the nature of those faults, so that they do not now represent the same difficulties they did in earlier stages of development.

Porcupine has sometimes been called the "Canadian Rand." Such a definition or comparison may at this time seem somewhat far-fetched, but when it is considered that the South African Rand comprises many square miles of territory, and when the same broad definition is given to the Porcupine, such a comparison seems fairly apt. The production at the present time in no wise compares, but the possibilities certainly do, and it does not seem unreasonable to imagine the gold production of our Northern Rand comparing very favorably with that of the great South African field in say another twenty-five years.

#### Kirkland Lake.

Kirkland Lake has also been the scene of some remarkably consistent development within the last eighteen months. On every property on the belt on which a reasonable amount of money has been expended, most encouraging results have followed, until now the district has two producing mines in the Tough-Oakes and Teck-Hughes, four about ready for milling equipment in the McKane, Lake Shore, Wright-Hargraves and La Belle, and several other prospects of certain promise on which development is now being carried out.

#### Other Gold Deposits.

Other districts, all of which give promise of becoming an important part of what has been above termed the Canadian Rand, are, the Township of Munroe, which already has a producer in the Croesus; Boston Creek with at least three attractive prospects in the Boston Creek, the R. A. P., and the Miller Independence; Tashota and the Nepigon country, where the St. Anthony and the Wells properties are being given intelligent trials; West Shining Tree, where several properties are undergoing preliminary development, and last, and possibly most interesting of all at the present time, the new discoveries at Fox Rapids in the Fort Matachewan territory, tributary to Elk Lake.

#### Future Possibilities.

Certainly enough has been proven in Northern Ontario to demonstrate without fear of contradiction the truth of a statement recently made by Mr. Arthur A. Cole, president of the Canadian Mining Institute, that in this section "greater mining possibilities exist than in any other part of the known world" and that "it does not require any very vivid imagination in looking to

the future, to picture the development of new mining districts converting the northern wilderness into thriving hives of industry."

A more general realization of the importance of this wonderful North country is certain to be forced upon us, possibly before we expect. It would seem extremely likely that after the great war is over, an impetus will be given to development that will make the progress of the last few years seem slow indeed.

Many of the men now wearing the khaki will probably have acquired a liking for the freedom of outdoor life that can only be satisfied by that offered in the North. To the men who are so fully deserving of opportunities, none can compare with those offered by our own Northern Ontario. What more fitting than that they should share them?

#### CORROSION OF COBALT ALLOYS.

The results of an investigation by H. T. Kalmus and K. B. Blake, of Cobalt alloys with non-corrosive properties has just been published by the Mines Branch, Ottawa.

Among the conclusions reached are:

The alloys formed by the addition of small percentages of copper, nickel, and cobalt (from 0.25 per cent. to 3.0 per cent) to American ingot iron, are more resistant to atmospheric corrosion than the pure American ingot iron, from which the alloys were prepared.

Considering the data for alloys formed by adding various amounts of cobalt (from 0.25 per cent. to 3.0 per cent) to American ingot iron, with very little, if any, carbon content, it is apparent that the corrosion is not a simple function of the percentage of cobalt content. In general, the corrosion of the alloys formed by the addition of 3 per cent. of cobalt to American ingot iron, is about 75 per cent. as great as that of the alloys formed by the addition of 0.5 per cent. cobalt.

Alloys formed by the addition of 0.25 per cent. to 3.0 per cent. cobalt to American ingot iron, with very little if any, carbon content, are corroded in the atmosphere to an extent varying between 50 per cent. and 75 per cent of that of the pure American ingot iron, from which the alloys were prepared.

#### FELDSPAR IN CANADA.

The Mines Branch, Ottawa, has just published a report by Hugh S. de Schmid on "Feldspar in Canada."

Mr. de Schmid says in part: "At the present time deposits situated more than a few miles from a railway cannot be worked profitably. Even where favorably located close to a rail point, the cost of freight to the New Jersey or Ohio potteries is sufficient to render development of all but the adjacent Ontario deposits a doubtful undertaking."

"As regards the possibility of extracting the potash content of feldspar, the most that can be said at this time, is that several processes have been evolved which are reported to have given satisfactory results. It still remains questionable, however, whether any of the methods proposed can successfully be employed on a commercial scale at a time of normal prices for potash salts."

Some of the best feldspar mined in America is that shipped from Frontenac Co., Ontario. The chief producer is Feldspars Limited.



## PERSONAL AND GENERAL

Mr. F. P. Burrall is now managing the Boyle properties in the Yukon.

Mr. Philip N. Moore of St. Louis, Mo., has been elected president of the A.I.M.E. Dr. W. G. Miller of Toronto has been again elected a director.

Mr. C. D. Kaeding, general manager of the Dome Mines, is in Nevada.

Mr. Arthur Rigby has joined the staff of Feldspars Limited, and is now with manager Ralph Scott at the mine at Hartington, Ont.

Mr. Geo. Rogers has returned to Toronto from West Shining Tree district, where he recently acquired gold properties.

Mr. J. B. Tyrrell has returned to Toronto from Manitoba after examining a gold property in the Rice Lake district.

Lieut. J. G. McMillan, who was mine inspector at Cobalt when he joined the army last year, has been awarded the Military Cross for conspicuous bravery.

Mr. M. W. Hotchkiss has been appointed consulting engineer for the Miller Independence mining company, Boston Creek.

Mr. J. P. Bickell of Toronto, has been elected president of McIntyre Porcupine Mines Limited.

Mr. S. R. Wickett has been elected president of Trethewey Silver Mines, Limited, succeeding the late A. M. Hay.

Mr. Geo. Mackenzie, Chief of the Division of Ore Dressing and Metallurgy, Mines Branch, Ottawa, addressed the Toronto Branch of the Canadian Mining Institute at a luncheon meeting of the branch on Saturday, Feb. 17. In the evening he addressed the Royal Canadian Institute.

Mr. J. H. Black, general manager of the Northern Canada Power Co., has been appointed managing director of the Excelsior Life Assurance Co.

Among those who attended the New York meeting of the American Institute of Mining Engineers last week were the following members from Toronto: Dr. W. G. Miller, J. B. Tyrrell, E. P. Mathewson, Fred Brule, Geo. Guess and R. E. Hore.

Dr. A. W. G. Wilson, of the Mines Branch, Ottawa, H. Mortimer-Lamb of Montreal, Charles Spearman of Mt. St. Patrick, Ont.; J. C. Nichols of Copper Cliff and F. P. Burrall of Dawson City attended the New York meeting of the American Institute of Mining Engineers last week.

Col. W. Stevenson, of Seattle, Washington, formerly of Alaska, and Mr. H. Hanson, of San Francisco, California, representing the recent purchasers of the Tyee Copper Co.'s smelter at Ladysmith, Vancouver island, B. C., early in February visited the works, at which Mr. W. J. Watson, general manager, is making important alterations and additions to the plant and ore reduction facilities generally.

Mr. Raleigh P. Trimble, of Portland, Oregon, recently returned from that city to Omineca mining division of British Columbia, where for some years he has been engaged in developing mining properties.

At the postponed annual meeting of the Western Coal Operators' Association, held at Calgary, Alberta, on February 9, Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., was elected president; Mr. O. E. S. Whiteside of Coleman, Alberta, general manager for the International Coal and Coke Co., Ltd., vice-president, and Mr. W. F. McNeill, of Calgary, secretary-treasurer (re-elected).

The association includes all the larger coal-mine operators in Alberta and the neighboring Crowsnest district of British Columbia.

Lieut. J. W. Bryant, of Company 258, Royal Engineers, B. E. F., formerly mine superintendent for the Tyee Copper Co., in British Columbia, is now at Orana, Egypt.

Major. J. R. Roaf, for years on the engineering staff of the Crow's Nest Pass Coal Co., and at the time of the outbreak of the present War, manager of the Pacific Coast Coal Mines Co.'s colliery at South Wellington, Vancouver Island, B.C., recently registered at office in London, England, of the Agent-General for British Columbia.

Mr. John F. Miller, before leaving Trail, B.C., for Australia last month, was entertained at a valedictory banquet by the officials and Trail staff of the Consolidated Mining and Smelting Co.; who presented him with a fine Old English solid silver tea service and tray. Numbers of old friends and fellow-employees at the company's electrolytic lead refinery and smelting works also made him a presentation, consisting of an illuminated address and a gold watch.

Mr. J. R. Lockard, of Cumberland, Vancouver island, B.C., has resigned as general manager for the Canadian Collieries (Dunsmuir) Limited, operating the Comox and Extension collieries, both on Vancouver island.

### MCINTYRE.

According to the official figures, McIntyre milled 14,317 tons of ore and produced \$145,297 in January. The average grade of ore was \$10.60 per ton. The average monthly production during October, November and December was \$118,764, while the average grade of ore milled was \$10.60; average tonnage treated was 13,123 tons.

McIntyre during 1916 milled 132,879 tons ore. The production was \$1,033,699, and the operating profit was \$564,264.

### COSTS AT THE HOLLINGER.

Manager P. A. Robbins says in his report for 1916: "In comparing our working costs of 1916 with those of 1915 shareholders will no doubt be struck by the fact that there is not much difference. Total costs in 1916 were \$4.03 per ton, as against \$3.98 in 1915. Excluding taxes and depreciation the costs were \$3.54 per ton in 1906, as against \$3.41 per ton in 1915, a rise of 13 cents per ton. The explanation of the smallness of the difference lies in the fact that the advantages due to consolidating the different properties have led to economies which have offset to a large extent the additional expense due to increased costs of supplies and inefficient labor. When normal conditions are again restored we shall no doubt show a reduction in working costs of from 40c to 50c per ton below present figures." Mr. Robbins shows that the purchase of ten tube mills and one hundred stamps, which in 1914 would have represented an outlay of \$59,115, in 1916 actually cost \$93,045, an increase of \$33,390. The "landed" cost of these items does not represent the entire expenditure of the company, for the import duties increased from \$11,699 to \$21,861, the increase being \$10,161.

"Thus it is evident that we are paying a very heavy war tax indirectly," writes the Managing Director, "for in operations alone we used approximately \$800,000 worth of supplies and over \$400,000 more in construction work."



## SPECIAL CORRESPONDENCE

### COBALT.

#### Buffalo.

The new Callow Oil Flotation plant at the Buffalo mine is now treating 400 tons of ore daily. 300 tons of this is coming from the huge sand pile which was considered as waste up to the time of installing the oil flotation. One hundred tons of ore is being taken from the underground workings of the mine, which are said to be looking better now than for some time past. The recovery from the present process is the best ever obtained at the plant and the loss is said to be less than one ounce per ton. A Holt-Dern furnace will be installed, which will permit of material changes in the refining resulting in a considerable decrease in costs of production in this department. The Buffalo is taking advantage of every step made by science to get for its shareholders all the benefits of the wonderful property which they possess.

#### Lorrain.

The shaft at the Lorrain Consolidated is now down a depth of 263 feet and a cross-cut has been run about eighty feet east. It was thought that the Keewatin was only 250 feet deep on the property, however, when the shaft reached this depth and drifting was commenced the Keewatin was found to be a good deal deeper to the east of the shaft. The management therefore decided to crosscut in the opposite direction to explore the ground at this depth and are now working in the diabase formation at the 263 foot level. To explore their property to the east of the shaft, it will be necessary to sink to deeper levels. The company are using the plant of the Haileybury Frontier Mining Company.

#### Crown Reserve.

The Crown Reserve Mining Company discovered a new vein containing four inches of good grade silver and about two feet of mill rock at the 700-foot level. A surprising feature of this discovery is that it was made in the Keewatin formation and fully six hundred feet from the diabase contact. This discovery is considered to be very important, and will probably mean much to the future of the Crown Reserve, which, according to the annual report of the mine manager, was pretty well worked out.

#### McKinley.

The new ball mill to replace the fifty stamps at present in use is being installed at the McKinley-Darragh. This change in the treatment of the ore from this mine is expected to show a considerable saving in milling costs and also to lead to a better recovery. The McKinley-Darragh installed the oil flotation process last July, putting in a hundred ton plant which has been running smoothly since that time. A year ago it was generally supposed that the McKinley-Darragh was about worked out as it was generally understood that the Keewatin came in on this property at the 250 foot level. Developments, however have shown that the conglomerate takes a sharp dip on the property and was found to continue to the 400-ft. level and this working is still in the silver bearing formation, and the company have met with very gratifying

results at this depth. A raise from the 400-foot to the 250-foot level has been completed and the timbering of the shaft has commenced. When this is completed the ore from the lowest working of the mine will be hoisted direct. The McKinley-Darragh should have many years' ore reserves ahead of her and with the improved system of treating these reserves a big future is still in store for this Cobalt property.

#### O'Brien.

The O'Brien Mine at Cobalt is said to have four years' ore reserves in sight at the present time and to be producing at the rate of one million ounces per annum. It is very likely that further ore bodies will be encountered during the period allowed for working out that which is already known to exist on the property. The O'Brien Mine is privately owned by Mr. M. J. O'Brien of Renfrew, and is one of the oldest in the Cobalt district. That there is still four years' ore supply ahead of the company after almost thirteen years of life, demonstrates the great future that may possibly be in store for other mines in the district.

#### Nipissing.

The Nipissing Mining Company's production during the month of January was below the average for the balance of the year, owing to the fact that there was a shut-down to allow for the annual "clean-up" and a number of changes and alterations and repairs to the equipment. The ore mined during the month was estimated at \$137,988, and the shipments of Nipissing and customs ore had a value of \$301,692. The high grade mill treated 66 tons and shipped 398,343 ounces of fine bullion, and the low grade mill treated 4,068 tons of ore. The following is an estimate of the production for the month of January:—

|                      |           |
|----------------------|-----------|
| Washing Plant .....  | \$83,986  |
| Low Grade Mill ..... | 90,002    |
| Total . . . . .      | \$173,988 |

#### Kirkland Lake.

The new transmission line to furnish power to the Kirkland Lake district is now completed and the trial tests were made this week. Power will be turned on permanently early next week. The plant has a capacity of 5,000 horse power, which will be sufficient for the needs of the district for some time to come. The line passes through the much talked of Boston Creek district and no doubt a good many of the properties developing in this section will avail themselves of the benefits of electric power. Recent developments in the Kirkland Lake camp indicate that the Northern Ontario Light and Power Co., have not entered the district blindly as there are at least four proven mines in the camp and a number of promising prospects which have been developing at a disadvantage awaiting the turning on of the much needed electric energy. Now that this power is available much more rapid developments are looked for from this section of the north country.

The estimated cost of the power plant to the Northern Ontario Light and Power Co., is said to be in



the neighborhood of \$300,000. Some delay was caused by the slowness in delivery of parts, but considering the distance covered is sixty miles and the difficulties met with in construction work in this country, the company have made good time in the installation of the plant. Much praise is due this enterprising concern for their pioneer work in the north country.

#### Beaver.

Developments on the two veins discovered at the 1,600 foot level of the Beaver mine recently are proving highly satisfactory. The two veins are running parallel and carry 1,500 and 2,000 ounce ore. There is seven feet between the two veins and this is of a very high grade milling ore. It is said that the company are preparing the shipment of a car-load of ore from the new discovery.

#### Gowganda.

It is understood that the Miller Lake O'Brien mine will soon enter the class of weekly shippers. This mine is located at Gowganda, and has been operating for a number of years with varying results. Last August a three foot vein of high grade silver was encountered at the 250 foot level. Further development work has been accomplished since that time and the shaft is now down to the 350 foot level and there is said to be no material change in the formation of the vein. Some of the ore runs as high as ten thousand ounces to the ton. Owing to the success attained on this property there are a number of prospects in the district which will be actively worked during the coming spring and summer. Owing to the fact that the Miller Lake-O'Brien is a closed corporation the activities of the company have not been heard much of. Lack of transportation facilities has discouraged development work in this district, and it is hoped some steps will be taken in the near future to improve this condition, and give the Gowganda Camp the opportunity to make good that recent developments warranted.



A popular method of traveling in Porcupine in winter. Driver is Mr. H. Darling, manager Dome Lake Mine.

#### Dome Lake.

The annual report of the Dome Lake Mining Company proved a very disappointing one for the shareholders. According to the report of Mr. Harry W. Darling, the ore reserves and results of development were greatly exaggerated in the previous reports on the property, and he was very pessimistic as to the

future. The mill was said to have a capacity of 200 tons per day and it was stated by the present manager that the cyanide equipment would only handle from 80 to 100 tons. A six foot by 22-inch Hardinge Mill was installed and many other additions and alterations made to the plant which cost \$22,133.22. The next returns from bullion shipped was \$18,267.09. The milling costs were \$14,345.43. Underground development work cost the company \$72,101.67. Ore breaking charges amounted to \$25,429.93. The management of the mine is now under the direction of Mr. Harry W. Darling, who will issue a report in the near future as to the outlook of the property.

#### South Bay.

The South Bay Mines company has commenced the erection of a power plant at Hangingstone Falls, about five miles from Gowganda. The plant will provide the district with 1,500 horse power. A considerable quantity of the energy generated will be used in the development of the company's own properties at this point. The intention is to install the plant in three units of 500 horse power each. The main scheme consists of placing a dam at Hangingstone Falls and diverting water from the east branch of the Montreal river through a tunnel to the Hangingstone Creek, a distance of 6,500 feet. Contracts have been let with a Haileybury firm for the construction of a dam before the spring freshet to develop 500 horse power for immediate use in completing the work. The project is said to involve the expenditure of approximately \$300,000. Philadelphia and Buffalo interests are supplying the capital for the venture.

#### TORONTO MARKETS.

Cobalt oxide, black, \$1.05 per lb.  
Cobalt oxide, grey, \$1.15 per lb.  
Cobalt metal, \$1.25 to \$1.50 per lb.  
Cobalt anodes, \$1.50 to \$1.75 per lb.  
Nickel metal, 45 to 50 cents per lb.  
White arsenic, 5½ to 6 cents per lb.

Feb. 19, 1917—(Quotations from Canada Metal Co., Toronto)—

Spelter, 13½ cents per lb.  
Lead 12¾ cents per lb.  
Tin, 60 cents per lb.  
Antimony, 35 cents per lb.  
Copper, casting, 36½ cents per lb.  
Electrolytic, 38 cents per lb.  
Ingot brass, yellow, 23 cents; red, 25½ cents per lb.

Feb. 22—(Quotations from Elias Rogers Co., Toronto)—

Coal, anthracite, \$9.50 per ton.  
Coal, bituminous, nominal, \$10 to \$14 per ton.

#### SILVER PRICES.

|          |    | New York.<br>cents. | London.<br>pence. |
|----------|----|---------------------|-------------------|
| February | 6  | 77                  | 37⅞               |
| "        | 7  | 77⅞                 | 37½               |
| "        | 8  | 77¼                 | 37⅞               |
| "        | 9  | 77¾                 | 37¾               |
| "        | 14 | 78½                 | 38¼               |
| "        | 15 | 78½                 | 38¼               |
| "        | 16 | 78½                 | 38¼               |

## MARKETS

## NEW YORK MARKETS.

## Connellsville coke—

Furnace, spot, \$11 to \$12.

Contract (nominal), \$6 to \$8.50.

Foundry, spot, \$12 to \$13.

Contract (nominal), \$8 to \$8.50.

Straits Tin, spot f.o.b. nominal, 50.00 cents.

## Copper—

Prime Lake, nominal, 34.00 to 35.00 cents.

Electrolytic nominal, 35.00 to 36.50 cents.

Casting, nominal, 32.50 to 33.50 cents.

Lead, Trust price, 8.50 cents.

Lead, outside, 10.00 to 10.25 cents.

Spelter, prompt western shipment, nominal, 10.42½ to 10.67½ cents.

Antimony—Chinese and Japanese, 29.00 to 30.00 cents.

## Aluminum—nominal—

No. 1 Virgin, 98-99 per cent., 57.00 to 59.00 cents.

Pure, 98-99 per cent. remelt., 51.00 to 53.00 cents.

No. 12 alloy remelt, 37.00 to 39.00 cents.

Powdered aluminum, 85.00 to 90.00 cents.

Metallic magnesium—99 per cent. plus, \$3.00 to \$3.50.

Nickel—shot and ingot, 45.00 cents.

Electrolytic, 50.00 cents.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$140.00.

## Platinum—

Pure, \$105.00.

10 per cent. Iridium, \$110.00.

Cobalt (metallic), \$1.50.

Tungsten ore per unit, \$17.00 to \$17.50.

Silver (official), 78½ cents.

Metal Products—Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

## Sheet Copper—

Hot rolled, 42.00 cents.

Cold rolled, 43.00 cents.

Copper bottoms, 50.00 cents.

Copper in rods (round), 41.00 cents.

Square and rectangular, 42.00 cents.

Copper wire, nominal, 41.00 to 42.00 cents.

Copper wire, April, May, 39.00 to 40.00 cents.

## High brass—

Sheets, 39.00 to 40.00 cents.

Wire and light rods, 40.00 cents.

Heavy rods, 38.00 to 39.00 cents.

Low Brass—sheet wire and rods, 42.00 cents.

## Tubing—

Braze bronze, 51.00 to 52.00 cents.

Braze brass, 48.00 to 49.00 cents.

Seamless copper, 45.00 to 46.00 cents.

Seamless brass, 43.00 to 45.00 cents.

Seamless bronze, 52.00 cents.

Full lead sheets, 9.75 to 10.25 cents.

Full lead sheets, 10.00 to 10.50 cents.

Sheet zinc, f.o.b. smelter, 21.00 cents.

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell &amp; Co., Toronto.)

As of close February 22, 1917

## New York Curb.

|                          | Bid. | Asked. |
|--------------------------|------|--------|
| Boston and Montana ..... | 1.65 | 1.75   |
| Canada Copper .....      | 1.75 | 1.87   |

|                               |           |       |
|-------------------------------|-----------|-------|
| Dome Extension .....          | .30       | .31   |
| Hargreaves. ....              | .20       | .21   |
| International Petroleum ..... | 12.25     | 12.50 |
| Kerr Lake .....               | 4.75      | 5.00  |
| La Rose Con. ....             | .50       | .56½  |
| McIntyre. ....                | 1.81      | 1.93  |
| N. America Pulp & Paper ..... | 7.37      | 7.62  |
| Nipissing. ....               | 8.00      | 8.25  |
| Superstition. ....            | .42       | .45   |
| Temiskaming. ....             | .59       | .61   |
| Thompson-Krist. ....          | .20 bid   |       |
| Tommy Burns .....             | .23       | .30   |
| Vipond. ....                  | No market |       |
| Victoria Oil .....            | 1.06      | 1.18  |

## Porcupine Stocks.

|                          | Bid.  | Asked. |
|--------------------------|-------|--------|
| Apex. ....               | .10¾  | .11    |
| Davidson. ....           | .84½  | .85    |
| Dome Extension .....     | .28½  | .29    |
| Dome Lake .....          | .29   | .30    |
| Dome Mines .....         | 19.50 | 20.50  |
| Gold Reef .....          | .02½  | .03½   |
| Hollinger Con. ....      | 5.25  | 5.30   |
| Inspiration. ....        | .12   | .13    |
| Jupiter. ....            | .30   | .32    |
| Lally Gold Mines .....   | .02   | ....   |
| McIntyre. ....           | 1.85  | 1.86   |
| Moneta. ....             | ....  | .12½   |
| Newray. ....             | 1.16  | ....   |
| Porcupine Crown .....    | .65   | .66½   |
| Porcupine Imperial ..... | .03⅝  | .03¾   |
| Porcupine Tisdale .....  | .02⅝  | .03    |
| Vipond. ....             | .47   | .47½   |
| Preston E. D. ....       | .05⅞  | .06    |
| Schumacher. ....         | ....  | .69    |
| Teck-Hughes. ....        | .70   | .74    |
| West Dome .....          | .29½  | .30    |
| Boston Creek Mines ..... | 1.25  | 1.26   |
| Kentucky Silver .....    | .21   | .25    |
| Vacuum Gas & Oil .....   | .35   | .38    |

## Cobalt Stocks.

|                         | Bid. | Asked. |
|-------------------------|------|--------|
| Adanac. ....            | .28  | .30    |
| Bailey. ....            | .... | .07    |
| Beaver Con. ....        | .47¼ | .48    |
| Chambers-Ferland. ....  | .15  | .15½   |
| Coniagas. ....          | .... | 4.20   |
| Crown Reserve .....     | .36  | .37    |
| Foster. ....            | .03  | ....   |
| Gifford. ....           | .04¼ | .04¾   |
| Great Northern .....    | .13¾ | .14    |
| Hargreaves. ....        | .20½ | .20¾   |
| Hudson Bay .....        | .... | 48.00  |
| La Rose .....           | .50  | .57    |
| Lorrain Con. ....       | .30  | .50    |
| McKinley-Dar.-Sav. .... | .52  | .54½   |
| Nipissing. ....         | 7.80 | 8.30   |
| Ophir. ....             | .09  | .10    |
| Peterson Lake .....     | .11  | .11½   |
| Right of Way .....      | .04½ | ....   |
| Rochester Mines .....   | .... | .04    |
| Silver Leaf .....       | .02¾ | .02½   |
| Shamrock Cons. ....     | .20½ | .21    |
| Temiskaming .....       | .59½ | .60    |
| Wettlaufer. ....        | .09½ | .11    |
| York, Ont. ....         | .02¼ | .02¾   |





## THIS ROW STARTED SOMETHING !

Pay-time disputes had been common until the last big one  
when three of the best men threatened to quit  
and then the Boss woke up.

The old-fashioned time-keeping system was to blame. No use expecting a human timekeeper to work without making mistakes or showing likes and dislikes.

No use of expecting labor to stand for this kind of thing, especially now-a-days when pay is high and jobs are a-plenty.

So, as we said, this row started something. Some one mentioned

## International Time Recorders

and how popular they are with the most up-to-date plants in Canada, big and small.

Said the boss: "Why use machinery to save labor and mistakes in every department of my business and not use it in connection with the most important raw material purchase I make: labor time? Also my employees need protection as well as I do. I'll get the facts right away."

And he did. And we got the order. And he got a cold-blooded, deadly accurate, time recording system where the men make their own time-records, get paid for every minute they work---but no more---and everybody is happy.

*Many of the Best Known Mines in Canada are Equipped  
with International Time Recorders.*



**The International Time Recording Co. of Canada, Limited**

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Winnipeg  
400 Electric Ry. Bldg.

Vancouver  
817 Pender St. W.

Montreal  
Cor. McGill and Notre Dame Sts.

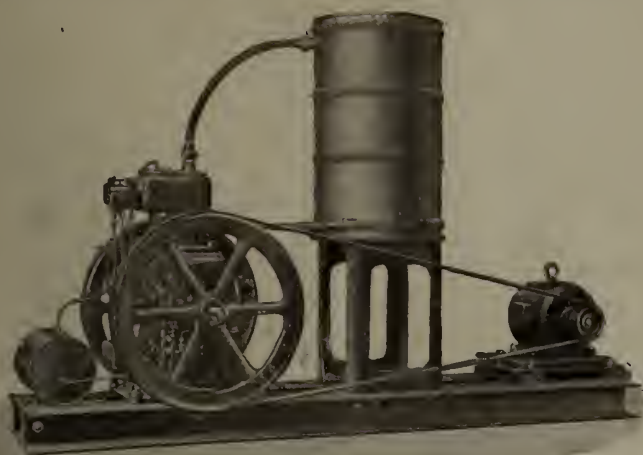


# The Canadian Miners' Buying Directory.

- Air Hoists—**  
Canadian Ingersoll-Rand Co., Ltd.
- Amalgamators—**  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Antimony**  
Canada Metal Co., Ltd.
- Assayers and Chemists—**  
Milton L. Hersey Co., Ltd.  
Campbell & Deyell, Cobalt  
Ledoux & Co., 99 John St., New York  
Thos. Heys & Son.  
C. L. Constant Co.
- Assayers' and Chemists Supplies—**  
C. L. Berger & Sons, 37 William St., Boston, Mass.  
Lyman, Ltd., Montreal, Que.  
Stanley, W. F. & Co., Ltd.
- Babbitt Metals**  
Canada Metal Co., Ltd.  
Can. Fairbanks-Morse Co.
- Ball Mills—**  
Fraser & Chalmers of Canada, Limited.  
Hull Iron & Steel Foundries, Ltd.
- Belting—Leather, Rubber and Cotton—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Blasting Batteries and Supplies—**  
Can. Ingersoll-Rand Co., Ltd.  
Curtis & Harvey (Canada) Ltd.  
Northern Canada Supply Co.  
Canadian Explosives, Limited
- Blowers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Boilers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.
- Boxes, Cable Junction—**  
Standard Underground Cable Co. of Can., Ltd.
- Buckets—**  
Can. Fairbanks-Morse Co.  
Hendrick Mfg. Co.  
M. Beatty & Sons Ltd.  
Northern Canada Supply Co.
- Cable — Aerial and Underground—**  
Fraser & Chalmers of Canada, Ltd.  
Northern Canada Supply Co.  
Standard Underground Cable Co. of Can., Ltd.
- Cableways—**  
Fraser & Chalmers of Canada, Limited.  
M. Beatty & Sons, Ltd.
- Cages—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cables—Wire—**  
Standard Underground Cable Co. of Canada, Ltd.
- Car Dumps—**  
Sullivan Machinery Co.
- Cars—**  
Can. Fairbanks-Morse Co.  
W. Fraser.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cement Machinery—**  
Northern Canada Supply Co.  
Hull Iron & Steel Foundries, Ltd.
- Chains—**  
Can. Fairbanks-Morse Co.  
Jeffrey Mfg. Co.  
Jones & Glassco.  
Northern Canada Supply Co.  
B. Greening Wire Co., Ltd.
- Chemists**  
Canadian Laboratories.  
Campbell & Deyell.  
Thos. Heys & Sons.  
Milton Hersey Co.  
Ledoux & Co.
- Coal—**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters—**  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Dock Bridges—**  
Roberts & Schaefer Co.
- Coal Mining Explosives—**  
Curtis & Harvey (Can.), Ltd.  
Canadian Explosives, Limited
- Coal Mining Machinery—**  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.  
Sullivan Machinery Co.
- Coal Pick Machines—**  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Washeries—**  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.
- Coaling Stations—**  
Roberts & Schaefer Co.
- Compressors—Air—**  
Can. Fairbanks-Morse Co.  
Darling Bros., Ltd.  
Escher Wyss & Co.  
W. Fraser.  
Smart-Turner Machine Co.  
Fraser & Chalmers of Canada, Limited.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Concentrators and Jigs—**  
Fraser & Chalmers of Canada, Limited.
- Concrete Mixers—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Wettlauffer Bros.
- Condensers—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.
- Converters—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Conveyor—Trough—Belt—**  
Can. Fairbanks-Morse Co.  
Jeffrey Mfg. Co.  
Hendrick Mfg. Co.
- Cranes—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
M. Beatty & Sons, Ltd.
- Crane Ropes—**  
Allan, Whyte & Co.  
B. Greening Wire Co., Ltd.
- Grinding Plates—**  
Hull Iron & Steel Foundries, Ltd.
- Crushers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Lyman, Ltd.  
Jeffrey Mfg. Co.  
Mussens, Limited.  
Hull Iron & Steel Foundries, Ltd.  
Wettlauffer Bros.
- Cyanide Plants—**  
Fraser & Chalmers of Canada, Limited.  
Roessler & Hasslacher.
- Derricks—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.
- Diamond Drill Contractors—**  
Diamond Drill Contracting Co.  
Smith and Travers.  
Sullivan Machinery Co.
- Dredger Pits—**  
Armstrong, Whitworth of Can., Ltd.
- Dredging Machinery—**  
M. Beatty & Sons.
- Dredging Ropes—**  
Allan, Whyte & Co.  
Fraser & Chalmers of Canada, Limited.
- Drills, Air and Hammer—**  
Can. Ingersoll-Rand Co., Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drills—Core—**  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.  
Sullivan Machinery Co.
- Drills—Diamond—**  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drill Steel—Mining—**  
Armstrong, Whitworth of Can., Ltd.
- Drill Steel Sharpeners—**  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Sullivan Machinery Co.
- Drills—Electric—**  
Can. Ingersoll-Rand Co., Ltd.  
Sullivan Machinery Co.
- Drills—High Speed and Carbon—**  
Armstrong, Whitworth of Can., Ltd.  
Can. Fairbanks-Morse Co.
- Dynamite—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Ejectors—**  
Can. Fairbanks-Morse Co.  
Darling Bros., Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Elevators—**  
Darling Bros., Ltd.  
Jeffrey Mfg. Co.  
M. Beatty & Sons.  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Wettlauffer Bros.
- Engineering Instruments—**  
C. L. Berger & Sons.
- Engineers and Contractors—**  
Fraser & Chalmers of Canada, Limited.  
Roberts & Schaefer Co.
- Engines—Automatic—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
- Engines—Gas and Gasoline**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Alex. Fleck.  
Sullivan Machinery Co.  
Smart-Turner Machine Co.
- Engines—Haulage—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Can. Ingersoll-Rand Co., Ltd.
- Engines—Marine—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
- Engines—Steam—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
M. Beatty & Sons.
- Fans—Ventilating—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.
- Feeders—Ore—**  
Fraser & Chalmers of Canada, Limited.
- Flights—**  
Hendrick Mfg. Co.
- Forges—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.
- Forging—**  
M. Beatty & Sons.  
Smart-Turner Machine Co.
- Furnaces—Assay—**  
Lyman, Ltd.
- Fuse—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Gears—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
Hull Iron & Steel Foundries, Ltd.
- Hammer Rock Drills—**  
Mussens, Limited.
- Hangers—Cable—**  
Standard Underground Cable Co. of Canada, Ltd.
- Hand Hoists—**  
Darling Bros., Ltd.  
Fraser & Chalmers of Canada, Limited.
- High Speed Steel—**  
Armstrong, Whitworth of Can., Ltd.
- High Speed Steel Twist Drills—**  
Northern Canada Supply Co.  
Armstrong, Whitworth of Can., Ltd.
- Hoists—Air, Electric and Steam—**  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco.  
M. Beatty & Sons.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Wettlauffer Bros.
- Hoisting Engines—**  
Can. Fairbanks-Morse Co.  
Mussens, Limited.  
Sullivan Machinery Co.  
Fraser & Chalmers of Canada, Limited.  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons.
- Hose—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Ingot Copper—**  
Canada Metal Co., Ltd.
- Insulating Compounds—**  
Standard Underground Cable Co. of Can., Ltd.
- Jacks—**  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Kiln Linings—**  
Hull Iron & Steel Foundries, Ltd.
- Kominuters—**  
Hull Iron & Steel Foundries, Ltd.
- Lamps—Safety—**  
Canadian Explosives.
- Link Belt—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Jones & Glassco.
- Locomotives—**  
W. Fraser.
- Machinists and Founders—**  
Hull Iron & Steel Foundries, Ltd.
- Metal Merchants—**  
Henry Bath & Son.  
Geo. G. Blackwell, Sons & Co.  
Consolidated Mining and Smelting Co. of Canada.  
Canada Metal Co.  
C. L. Constant Co.
- Monel Metal—**  
International Nickel Co.
- Nickel—**  
International Nickel Co.
- Ore Sacks—**  
Northern Canada Supply Co.
- Ore Testing Works**  
Ledoux & Co.  
Can. Laboratories.  
Milton Hersey Co., Ltd.  
Campbell & Deyell.
- Ores and Metals—Buyers and Sellers of—**  
C. L. Constant Co.  
Geo. G. Blackwell.  
Consolidated Mining and Smelting Co. of Canada.  
Orford Copper Co.  
Canada Metal Co.
- Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
- Pig Tin—**  
Canada Metal Co., Ltd.
- Pig Lead—**  
Canada Metal Co., Ltd.
- Pipes—**  
Can. Fairbanks-Morse Co.  
Canada Metal Co., Ltd.  
Consolidated M. & S. Co.  
Pacific Coast Pipe Co., Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.
- Pipe Fittings—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Piston Rock Drills—**  
Mussens, Limited.
- Pneumatic Tools—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco.
- Prospecting Mills and Machinery—**  
Standard Diamond Drill Co.  
Fraser & Chalmers of Canada, Limited.



# ELECTRIC LIGHT AND POWER



LISTER-BRUSTON AUTOMATIC  
ELECTRIC LIGHTING AND GEN-  
ERATING PLANTS

LISTER STORAGE BATTERY  
SETS—SEMI-AUTOMATIC

LISTER GASOLINE AND GAS  
ENGINES—PUMPS, Etc.

Supplied to British, French and Cana-  
dian Governments, British War Office.  
200 plants in use in Canada.

The Lister-Bruston Plant is built in many sizes, from 50 to 1,000 lights. Suitable for hotels, public institutions, country homes, churches and for town lighting.

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# Aikenhead's Van Dorn Portable Electric Drills

*Solve the Hole Problem*

*They drill more holes in America  
than any other make*



| Model | Capacity | 1 in. | in Steel |
|-------|----------|-------|----------|
| DA00  | "        | 1 1/4 | " "      |
| DA0   | "        | 3/8   | in. " "  |
| DA1   | "        | 1/2   | in. " "  |
| DA1X  | "        | 5/8   | in. " "  |
| DA2   | "        | 7/8   | in. " "  |
| DA2X  | "        | 1     | in. " "  |

ALL SIZES IN STOCK, TORONTO

## AIKENHEAD HARDWARE LIMITED

17 TEMPERANCE STREET, TORONTO

## Canadian Miners' Buying Directory.—(Continued from page 14.)

|                                                                                                                                                                                                                                                  |                                                                                                                                             |                                                                                                                                                                   |                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pulleys, Shafting and Hangings—</b><br>Can. Fairbanks-Morse Co.<br>Fraser & Chalmers of Canada, Limited<br>Jeffrey Mfg. Co.<br>Northern Canada Supply Co.                                                                                     | <b>Darling Bros., Ltd.</b><br>Smart-Turner Machine Co.<br>Canadian Ingersoll-Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited         | <b>Scales—</b><br>Can. Fairbanks-Morse Co.                                                                                                                        | <b>Steel Drums—</b><br>Smart-Turner Machine Co.                                                                                        |
| <b>Pumps—Boiler Feed—</b><br>Can. Fairbanks-Morse Co.<br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.<br>Northern Canada Supply Co.<br>Canadian Ingersoll-Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited<br>Wettlaufer Bros.          | <b>Pumps—Vacuum—</b><br>Can. Fairbanks-Morse Co.<br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.                                         | <b>Screens—</b><br>B. Greening Wire Co., Ltd.<br>Jeffrey Mfg. Co.<br>Northern Canada Supply Co.<br>Fraser & Chalmers of Canada, Limited<br>Roberts & Schaefer Co. | <b>Steel—Tool—</b><br>N. S. Steel & Coal Co.<br>Armstrong, Whitworth of Can., Ltd.                                                     |
| <b>Pumps—Centrifugal—</b><br>Can. Fairbanks-Morse Co.<br>Darling Bros., Ltd.<br>Escher Wyss & Co.<br>Mussens, Limited.<br>Smart-Turner Machine Co.<br>M. Beatty & Sons.<br>Can. Ingersoll-Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited | <b>Quarrying Machinery—</b><br>Sullivan Machinery Co.<br>Can. Ingersoll-Rand Co., Ltd.                                                      | <b>Screens—Cross Patent Flanged Lip—</b><br>Hendrick Mfg Co.                                                                                                      | <b>Surveying Instruments—</b><br>W. F. Stanley.<br>C. L. Berger.                                                                       |
| <b>Pumps—Electric—</b><br>Can. Fairbanks-Morse Co.<br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.<br>Canadian Ingersoll Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited                                                               | <b>Rails—</b><br>W. Fraser.                                                                                                                 | <b>Separators—</b><br>Can. Fairbanks-Morse Co.<br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.                                                                 | <b>Tanks—Cyanide, Etc.—</b><br>Fraser & Chalmers of Canada, Limited<br>Hendrick Mfg. Co.<br>Pacific Coast Pipe Co., Ltd.               |
| <b>Pumps—Pneumatic—</b><br>Can. Fairbanks-Morse Co.<br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.<br>Can. Ingersoll-Rand Co., Ltd.<br>Sullivan Machinery Co.                                                                                | <b>Roasting Plants—</b><br>Fraser & Chalmers of Canada, Limited                                                                             | <b>Sheet Lead—</b><br>Canada Metal Co., Ltd.                                                                                                                      | <b>Tipples—</b><br>Roberts & Schaefer Co.                                                                                              |
| <b>Pumps—Steam—</b><br>Can. Fairbanks-Morse Co.<br>Can. Ingersoll-Rand Co., Ltd.<br>Darling Bros., Ltd.<br>Mussens, Limited.<br>Northern Canada Supply Co.<br>Smart-Turner Machine Co.                                                           | <b>Rolls—Crushing—</b><br>Fraser & Chalmers of Canada, Limited                                                                              | <b>Sheets—Genuine Manganese Bronze—</b><br>Hendrick Mfg. Co.                                                                                                      | <b>Transits—</b><br>C. L. Berger & Sons.                                                                                               |
| <b>Pumps—Turbine—</b><br>Can. Fairbanks-Morse Co.                                                                                                                                                                                                | <b>Roofing—</b><br>Can. Fairbanks-Morse Co.<br>Northern Canada Supply Co.                                                                   | <b>Shovels—Steam—</b><br>M. Beatty & Sons.<br>W. Fraser.                                                                                                          | <b>Tube Mills—</b><br>Fraser & Chalmers of Canada, Limited                                                                             |
|                                                                                                                                                                                                                                                  | <b>Rope—Manilla and Jute—</b><br>Jones & Glassco.<br>Northern Canada Supply Co.<br>Allan, Whyte & Co.                                       | <b>Smelting Machinery—</b><br>Fraser & Chalmers of Canada, Limited                                                                                                | <b>Turbines—</b><br>Escher Wyss & Co.<br>Fraser & Chalmers of Canada, Limited                                                          |
|                                                                                                                                                                                                                                                  | <b>Rope—Wire—</b><br>B. Greening Wire Co., Ltd.<br>Allan, Whyte & Co.<br>Northern Canada Supply Co.<br>Fraser & Chalmers of Canada, Limited | <b>Stacks—Smoke Stacks—</b><br>Can. Fairbanks-Morse Co.<br>Hendrick Mfg. Co.                                                                                      | <b>Valves—</b><br>Can. Fairbanks-Morse Co.                                                                                             |
|                                                                                                                                                                                                                                                  | <b>Samplers—</b><br>C. L. Constant Co.<br>Ledoux & Co.<br>Milton Hersey Co.<br>Thos. Heys & Son.                                            | <b>Stamp Mills—</b><br>Fraser & Chalmers of Canada, Limited                                                                                                       | <b>Winding Engines—</b><br>Canadian Ingersoll-Rand Co., Ltd.                                                                           |
|                                                                                                                                                                                                                                                  |                                                                                                                                             | <b>Steel Barrels—</b><br>Smart-Turner Machine Co.                                                                                                                 | <b>Wire Cloth—</b><br>Northern Canada Supply Co.<br>B. Greening Wire Co., Ltd.                                                         |
|                                                                                                                                                                                                                                                  |                                                                                                                                             | <b>Steel Drills—</b><br>Sullivan Machinery Co.<br>Northern Canada Supply Co.<br>Can. Ingersoll-Rand Co., Ltd.                                                     | <b>Wire (Bare and Insulated)—</b><br>Standard Underground Cable Co., of Canada, Ltd.<br><b>Zinc Spelter—</b><br>Canada Metal Co., Ltd. |

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We wish to draw the attention of mining, metallurgical, and development corporations to our excellent facilities for compiling, arranging, illustrating, printing and distributing Annual Statements, Special Reports, Descriptive Pamphlets, etc.

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TORONTO

OR

**Canadian Mining Journal,**

263-5 ADELAIDE ST. WEST  
Toronto



# MINE AND QUARRY EQUIPMENT

## AIR COMPRESSORS

- 1 Ingersoll Rand Class P.B.-2 heavy duty belt driven 20 $\frac{1}{4}$  x 12 $\frac{1}{4}$  x 18" stroke, capacity 1,117 cu. ft. piston displacement.
- 1 Gardner belt driven 12 x 12", capacity 247 cu. ft.
- 1 Rand Class C. straight line, 16" x 24", capacity 640 cu. ft.
- 1 Rand Class C. straight line 14" x 22", capacity 410 cu. ft.
- 1 Rand Class C. straight line 12" x 18", capacity 329 cu. ft.

## AIR RECEIVERS

- 1 60" x 14' for 125 lbs. air pressure.
- 1 42" x 10' for 100 lbs. air pressure.
- 1 42" x 7' for 100 lbs. air pressure.
- 1 36" x 12' for 100 lbs. air pressure.

## BOILERS

- 4 300-h.p. Sterling Water Tube.
- 2 125-h.p. Return Tubular.
- 1 100-h.p. Return Tubular.
- 2 60-h.p. Return Tubular.
- 1 150-h.p. Marine Fire Box Type.
- 1 35-h.p. Locomotive Type.
- 1 25-h.p. Locomotive Type (New).
- 1 15-h.p. Locomotive Type (New).
- 2 12-h.p. Locomotive Type (New).
- 1 10-h.p. Locomotive Type (New).
- 1 20-h.p. Vertical Type.
- 2 12-h.p. Vertical Type.

## CARS

- 4 14-cu. ft. Side and End Dump.
- 4 14-cu. ft. Mine Cars.
- 90 1-cu. yd. Petlor Cars.
- 60 4-cu. yd. Western Dumps.

## CRUSHERS

- 1 Austin No. 7 $\frac{1}{2}$  Gyratory.
- 1 Austin No. 5 Gyratory.
- 1 Kennedy No. 3 Gyratory (New).
- 1 Gates No. 2 Gyratory (Nearly New).
- 3 McCully No. 4 Gyratory.
- 1 Champion No. 5 Jaw.
- 1 Blake 7 x 10 Jaw.

## DRAGLINE EXCAVATORS

- 1 No. 2 Monighan Excavator 60' Boom.
- 1 Class 20 Bucyrus 85' Boom.

## DRILLS

- 13 Rand No. 43 Piston Drills.
- 2 Rand No. 63 $\frac{1}{4}$  Piston Drills.
- 6 Rand No. 44 Piston Drills.
- 1 Burrell No. 847 Piston Drill.
- 2 Ingersoll Eclipse Piston Drills.
- 1 Air Boring Drill Class 1d.

## DRILL MOUNTINGS

- 12 Tripods for above drills.
- 6 Drifting Columns, with arm and clamps.
- 6 Shaft Bars, with arm and clamp.

## DRILL STEEL

- 10,800 lbs., made up 1 $\frac{1}{8}$ " and 1 $\frac{1}{4}$ ", solid lengths 2' to 12'.
- 19,800 lbs. 1 $\frac{1}{8}$ " solid octagon (new).
- 6,800 lbs. 1 $\frac{1}{4}$ " solid octagon (new).
- 10,300 lbs. 1" solid octagon (new).
- 1,800 lb.  $\frac{7}{8}$ " hollow hexagon (new).
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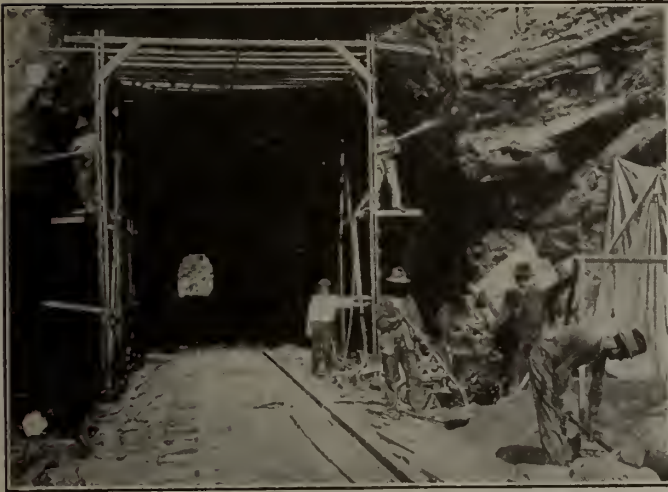
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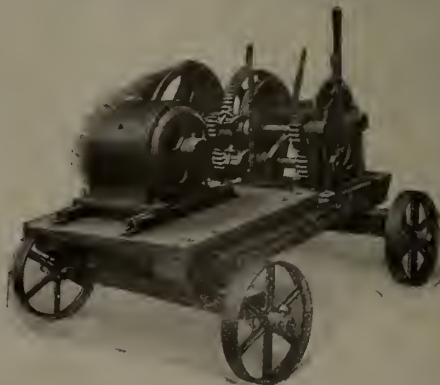
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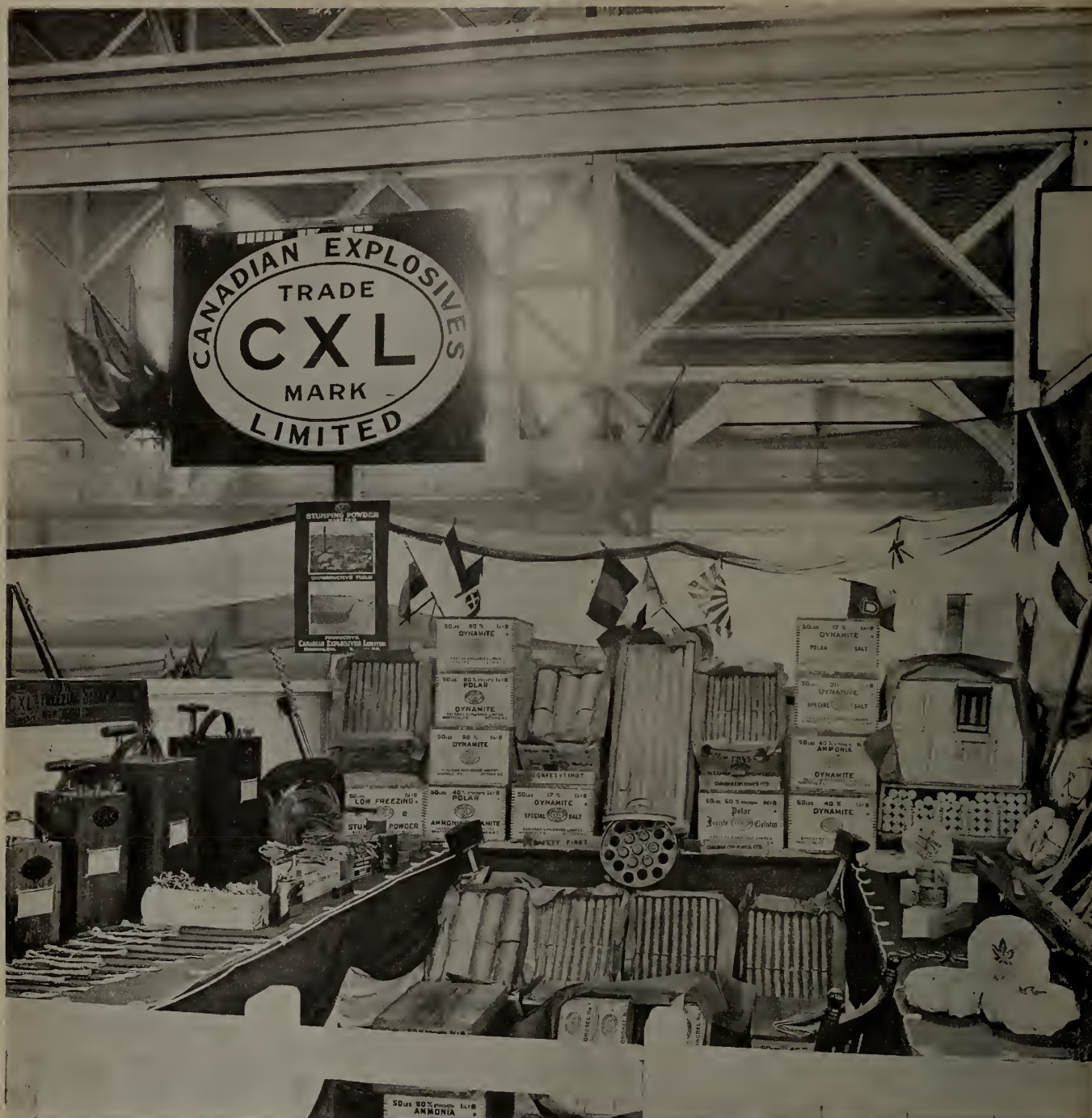


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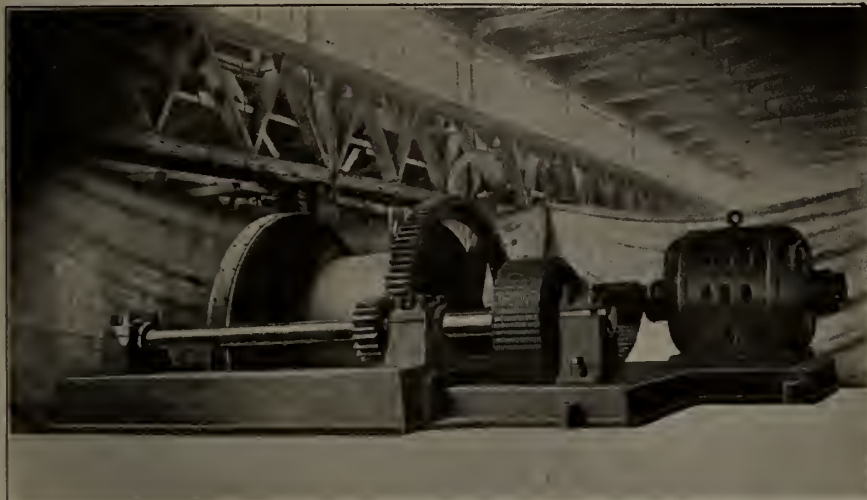
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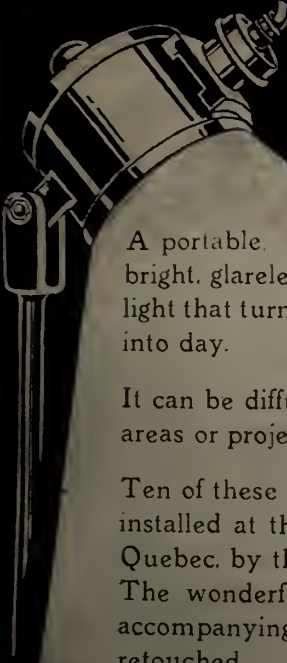
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**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is \$10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of \$10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of \$5 an acre for SUPERIOR METALS, and \$3 an acre for INFERIOR MINERALS.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

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Ontario in 1915 produced over 44 per cent. of the total mineral production of Canada, or more than twice that from any other Province. The preliminary report of the Ontario Bureau of Mines shows the output of the mines and metallurgical works of Ontario for the year 1915 to be worth \$57,532,844, of which the metallic production was \$47,721,180. There were 79 producing mines, 62 of which operated at a profit.

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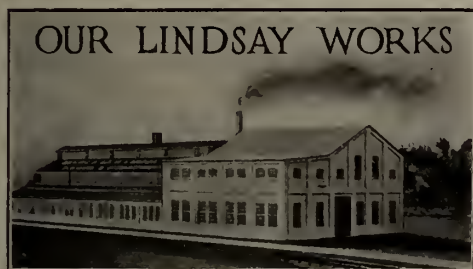
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### MINES BRANCH

#### Recent Publications

The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.

The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

**Fuel Testing Laboratory.**—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

**Ore-Dressing Laboratory.**—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

**Chemical Laboratory.**—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

**Ceramic Laboratory.**—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

**Structural Materials Laboratory.**—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

### GEOLOGICAL SURVEY

#### Recent Publications

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

Memoir 81. The Oil and Gas Fields of Ontario and Quebec, by W. Malcolm.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Memoir 85. Road Material Surveys in 1914, by L. Reinecke.

Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.

Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.

Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.

Map 59A. Wheaton, Yukon Territory.

Map 66A. Brechin Sheet, Ontario and Victoria Counties.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

Map 153A. Asquith and Churchill Townships, Sudbury District, Ontario.

Map 158A. Nanaimo Sheet, Vancouver Island, British Columbia.

Map 175A. Ymir, Kootenay, British Columbia.

Map 181A. Wood Mountain-Willowbunch Coal Areas, Saskatchewan.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

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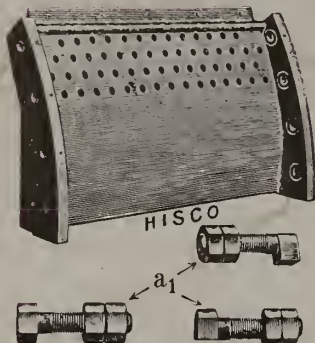
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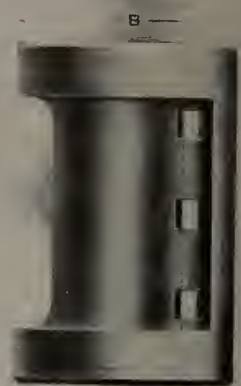
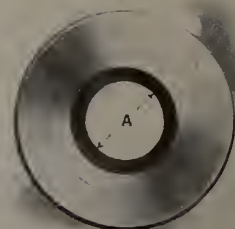
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### MINES BRANCH

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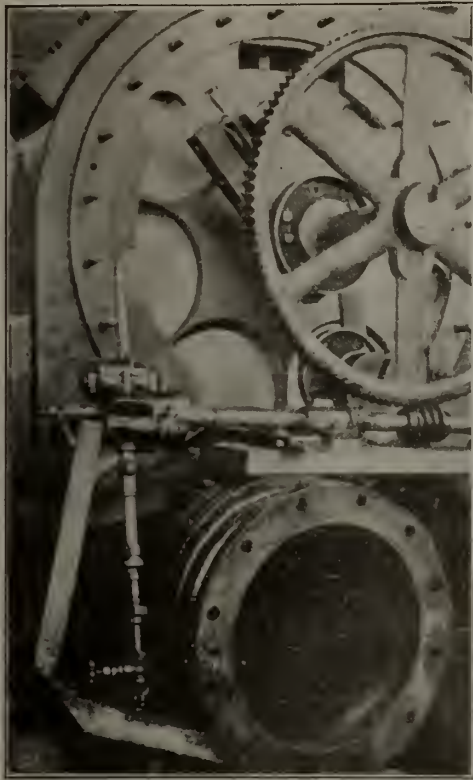
- The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.
- Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.
- Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
- Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.
- Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.
- The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—
- Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.
- Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.
- Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.
- Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.
- Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.
- Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

### GEOLOGICAL SURVEY

#### Recent Publications

- Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.
- Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.
- Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.
- Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.
- Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.
- Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.
- Memoir 81. The Oil and Gas Fields of Ontario and Quebec, by W. Malcolm.
- Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.
- Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.
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- Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.
- Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.
- Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.
- Ontario. Topography.
- Map 59A. Wheaton, Yukon Territory.
- Map 66A. Brechin Sheet, Ontario and Victoria Counties.
- Map 150A. Ponhook Lake Sheet, Nova Scotia.
- Map 153A. Asquith and Churchill Townships, Sudbury District, Ontario.
- Map 158A. Nanaimo Sheet, Vancouver Island, British Columbia.
- Map 175A. Ymir, Kootenay, British Columbia.
- Map 181A. Wood Mountain-Willowbunch Coal Areas, Saskatchewan.
- Applicants for publications not listed above should mention the precise area concerning which information is desired.
- Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.
- The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.
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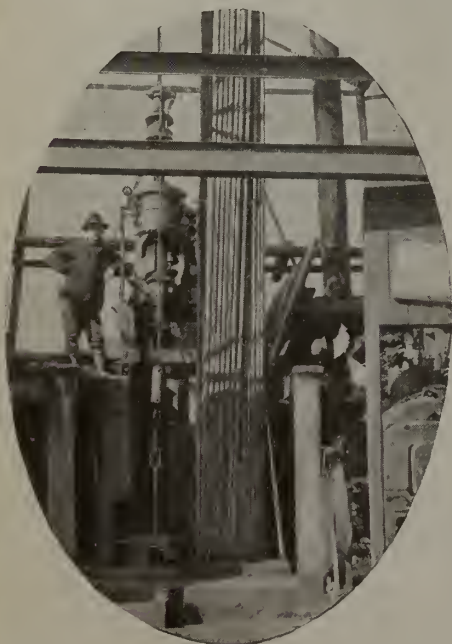
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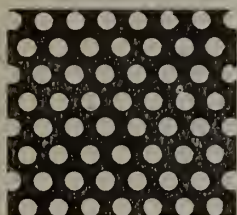
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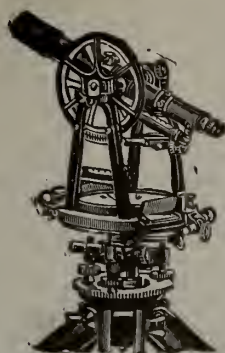
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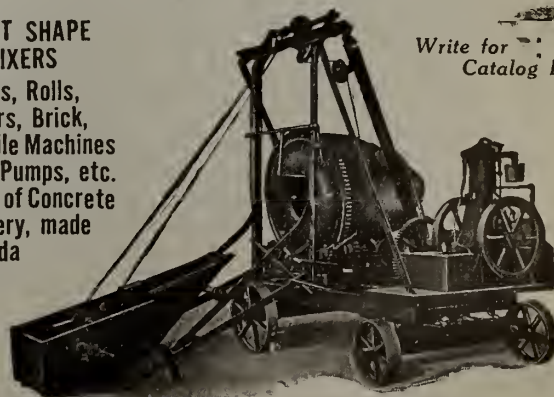
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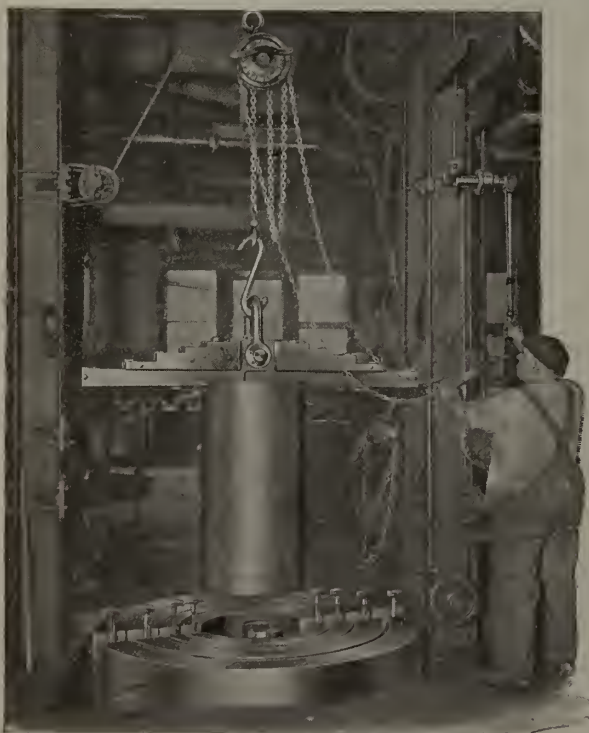


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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, March 15th 1917.

No. 6

## The Canadian Mining Journal

With which is incorporated the  
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Editor

REGINALD E. HORE

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### CIRCULATION

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### THE C. M. I. MEETING.

It was jocularly remarked by an American visitor at the annual meeting of the Canadian Mining Institute last week that the members are taking themselves very seriously. They are. As President Cole remarked, the reason is not far to seek.

Under ordinary conditions the present great activity in the Canadian mining industry might be expected to result in the meetings of mining men being even more hilarious than those meetings of a few years ago. The war is, however, now the subject of greatest interest to all mining men in Canada and there is no great desire to make merry.

Twenty-five per cent. of the Canadian members of the Canadian Mining Institute are now at the front. The thoughts of those who remain are with them, wishing them success and a safe return. When they come back we will have the most enjoyable meeting ever held.

The demand for minerals of all kinds is being met as far as possible in Canada and great success is being achieved in the production of a number of minerals concerning which we knew little a few years ago in Canada. The technical and descriptive papers presented at last week's meeting were therefore listened to and discussed with a special degree of interest.

Mr. H. C. Hoover has been elected an honorary member of the Canadian Mining Institute. He has won the admiration of Canadian mining men for his services as chairman of the Belgian Relief Commission. This distinction helps to convey to Mr. Hoover our appreciation of the work he and his fellow engineers are doing for humanity.

A considerable part of the Dominion Government ore-testing plant at Ottawa is at present being operated as a custom plant for the treatment of molybdenite ore. Excellent work is being done, but it is to be hoped that private enterprise will soon relieve the Mines Branch of this work so that further investigations can be carried on. The function of the Mines Branch is primarily to investigate and to show how ores can be treated.

As pointed out by President Cole at the annual meeting of the Canadian Mining Institute, Canadian gold and silver mining companies are obtaining cyanide at the pre-war price. Our American friends are not so fortunate. They are largely dependent on the American branch of a German company which has shown no great desire to meet the demands. Canadian users, in common with others throughout the Empire, are being supplied by a Glasgow firm which is also doing important work for war purposes.

The importance of some of the work being done by the Mines Department at Ottawa was brought out in connection with discussions on the production of molybdenite in Canada. Mr. Geo. C. Mackenzie of the Mines Branch is to be congratulated on the success of his efforts.

Mr. S. V. Ells of the Mines Branch is doing good work in connection with the development of the bituminous sands of Alberta. He has carefully mapped and tested the deposits and has superintended the laying of a pavement in Edmonton. He has pointed out the possibilities and also called attention to some of the difficulties and to the failures in other places. As the railway will soon be completed to Fort Murray transportation to centres of population is now provided for.

A possible source of pebbles for mill purposes was indicated at the Montreal meeting by Mr. N. B. Davis of the Mines Department, Ottawa. According to Mr. Davis, there are large quantities of good pebbles in certain parts of Saskatchewan. Mr. Davis was studying the clay deposits and noted the pebble deposits incidentally. In view of the present scarcity and high price of suitable pebbles it is to be hoped that the Saskatchewan deposits will be further investigated.

#### MINING IRON CARBONATES IN ONTARIO.

A large deposit of siderite, iron carbonate, is being mined in the Michipicoten district, Ontario, by the Algoma Steel Corporation. The method of mining and treating the ore was described in a paper presented by Mr. A. Hasselbring at the annual meeting of the Canadian Mining Institute on March 8.

The ore is roasted in cement kilns and the product has a chemical composition and physical properties which make it very suitable for use in the blast furnace.

A report from Kamloops is that a net return of \$1,400 has been received from a carload of gold-quartz ore shipped from the Wind Pass mineral claim situated in the neighborhood of Dunn Creek, North Thompson River. Included in the ore receipts at the Trail smelting works during the week ended December 7, 1916, was a lot of 33 tons from the Wind Pass. This property and the Fog Horn are stated to be about 80 miles north of Kamloops, on Whistler mountain, near the head of Joseph (Boulder) creek.

Eli Carpenter, who with John L. Seaton made the first discoveries of valuable mineral on the Slocan slope, they having located on September 2, 1891, the mineral claim that afterward became the famous Payne mine, died recently at Annis, B. C., from acute indigestion, at the age of 75 years. From Slocan he went to Alberta, and in 1898 was one of a party that

Mr. F. E. Lathe, in charge of the Granby Consolidated Co's laboratory at its big copper smelter at Grank Forks, Boundary district of British Columbia, has returned from a trip to Montreal, Quebec, whence he was called owing to the death of his brother.

#### MINING CONDITIONS IN ROSSLAND CAMP, B.C.

A Vancouver, B.C. newspaper recently published an account of an interview with Mr. Ernest Levy, manager of the mines at Rossland, B.C., of the Le Roi No. 2, Ltd. He is reported to have said:

"Rossland is doing well, I am glad to say, not from the flighty and uncertain point of view which characterizes the so-called success of many mining camps, but from the standpoint of stability, which, in spite of everything, is the only real test.

"Mining in Rossland, as far as the possibilities of the mines go is better than ever. Development has been fully satisfactory, and there is ore in sight, and other yet unknown which will, without doubt, secure the maintenance of extraction at the usual rate for years to come.

"The customary rate of shipping does not apply at the present time and has not done so for several months, but conditions recently have considerably improved and we hope soon to resume normal extraction.

"The factors which have interfered with our mining are a deficiency of labor and shortage of coke required for smelting. The labor situation is decidedly better than it was a few months ago, and the forces obtainable are adequate.

"Coke became scarce on account of the labor troubles in the Crow's Nest district coal mines. The disorganization of the fuel distribution naturally has proved of much longer duration than the actual period of disorganization of labor. We trust that the new agreement between coal mines employees and employers will be formulated without causing any renewed interference with coal production.

"Especially during the war it is of the utmost importance that industries should continuously progress. We should all take a leaf from the soldiers' book and let the welfare of the country take preference over personal benefits, and in doing this we will also give a measure of support to the soldiers without whom we should probably no longer be the owners of Canada.

"Wages in Rossland are higher than ever in spite of the fact that the value of the metallic contents of the ore does not justify the increase made. We increased wages to this extent for the purpose of continuing to prosecute our mining and to retain the services of the men who mostly have been with us for many years and who have their homes in Rossland.

"As you know, the value of gold has decreased greatly since the war started, consequently Rossland has been obliged, to a great extent, to eliminate the extraction of the more auriferous ores and, as far as practicable, press the production of the more copper-bearing ores.

"This, of course, necessitates somewhat of a variation in the general policy of the camp."

The mining committee of the Vancouver, B. C. Board of Trade has announced that it is most desirous of encouraging legitimate mining development in British Columbia and it is most desirous of preventing "wildeating." It therefore warns all citizens, visitors, and strangers to use every precaution before buying any mining shares or claims without having first instituted a thorough investigation and inquiry from responsible persons.



## CORRESPONDENCE

## WASTE THROUGH DUPLICATION.

Editor Canadian Mining Journal, Toronto:

Sir,—In your issue of February 1st you state that the Commission of Conservation "spends much of its efforts in duplicating work done in other departments."

This statement is simply not true and, if you will make a specific statement, I will demonstrate that it has no foundation in fact. It is quite true, however, that we have undertaken work that has been neglected by other organizations and that, later, another organization has taken it up, thus duplicating our work.

You also state that we claimed "the discovery of phosphate deposits in the Rockies, when, as a matter of fact, what had been done was the re-discovery of deposits known to be of no economic value."

This statement is essentially untrue and the fact that Dr. Frank D. Adams attached his signature to the report is sufficient to demonstrate its inaccuracy.

(1) After the discovery by Dr. Adams and Mr. Dick had been published, we were informed that Mr. W. F. Ferrier had prospected in the Banff area but that his operations had been carried out secretly and nothing had been published as the information was the private property of his principals. Furthermore, Mr. Ferrier did not obtain permission to publish anything till March, 1916, although our discovery had been published in the preceding August. It is not necessary to tell anyone conversant with the English language and the ethics of science that, while interesting, this does not in any way detract from the credit due Dr. Adams and Mr. Dick. While we sympathise with Mr. Ferrier, he was only in the same position as hundreds of other mining engineers before him, and, when he accepted his employers' proposition, he knew the conditions attached thereto.

(2) As not one thousandth nor one ten thousandth part of the phosphate-bearing strata has been examined, your statement that the deposits are "known" to be of no economic value is unadulterated piffle.

So far as your references to the Commission of Conservation are concerned, your editorial is reminiscent of a certain historian of whom it was said that his history "had the merit of originality; in fact it was full of originality because he invented it as he wrote."

Yours, etc.,

JAMES WHITE.

Ottawa, February 13.

Assistant to Chairman.

The tone of Mr. White's remarks is such that his misstatements are not to be wondered at. He has the difficult task of attempting to justify the existence of a Commission which has no sufficient reason for existence.

With regard to the discovery of phosphate boulders at Banff, Mr. White seems to think that only a question of priority in publication of discovery is involved. As a matter of fact the Commission persists in publishing glowing reports of the possibilities of imaginary resources, reports that are on a par with a wild-cat prospectus. It is further to be noted that the Commission was warned long before the voluminous reports were distributed. It is evident that the desire to publish a glowing report was so strong that nothing could prevent the dissemination of misleading information.—Ed.

## QUEBEC IN 1916.

The banner year of the mineral production of the Province of Quebec was 1913. 1916 is only, however,  $\frac{1}{2}$  of one per cent. behind 1913. Moreover it is to be noted that if we compare the value of the "products of the mines" for these two years, leaving aside the structural materials, we find that the figures are \$4,931,894 for 1913 and \$7,982,430 for 1916, a considerable advance of 62 per cent. The diminution in the structural materials is of course due to the economic conditions which have prevailed since the beginning of the war.

## MOLYBDENITE.

Very important shipments of molybdenite are being made from the Quyon mine of the Canadian-Wood Molybdenite Co. This mine was first opened in April 1916 and the first carload of molybdenite ore was shipped from it some three weeks later. There is now a well equipped mill for crushing and concentrating at Quyon, and another mill for concentration has been put up at Hull, the crushing of this ore being done by the cement works. The Quyon mine is probably the largest producer of molybdenite in America.

## QUEBEC CHROMITE.

New record figures, both in tonnage and value 27,055 tons, \$299,070, were reached in 1916 in the shipments of chromite from the Coleraine-Black Lake district. The prices which prevailed throughout the year were very satisfactory, and in the latter part of the year, the following scale was in force, for chromite f. o. b. Quebec Central Ry's stations: 50 per cent. ore, \$45.00 a ton; 40 per cent. ore, \$38.75; 30 per cent. ore, \$22.50; 25 per cent. ore, \$18.00. For special purposes, ore over 50 per cent. can be marketed at \$1.00 a unit.

The two concentrating mills of the Mutual Chemical Company of Canada, one at Black Lake and the other on lot 7 range B of Coleraine, are now in operation.

## ASBESTOS.

The asbestos mines of Quebec have been extremely active throughout the year. The shipments in 1916 amounted to 133,339 tons, valued at \$5,182,905. The market could have absorbed much more asbestos than was offered, but the output was limited by the shortage of labor. As the demand was greater than the offer, the prices rose accordingly, more especially for the higher grades. As a result of this, although the tonnage shipped in 1916 shows an advance of only 18 per cent. as compared with 1915, the value increased 46 per cent. This is reflected in the average price per ton which was \$38.87 in 1916; \$31.33 in 1915; \$26.96 in 1914; \$28.04 in 1913.

The uses of asbestos have been greatly extended during the last two years and it is ever increasingly used in the manufacture of automobile tires, brake bands, tubings, coverings and tapes for electric wire insulating. These are practically new uses which must be added to the old uses.

The total amount of asbestos-bearing rock mined during the year amounted to 2,291,087 tons. The value of asbestos extracted from it, counting stocks on hand at the end of the year at the average rates of the year, was \$4,878,931. This represents an average value of \$2.13 of asbestos extracted from each ton of rock mined. In 1915 and 1914 these values were \$1.46 and \$1.44 respectively.



# PRELIMINARY REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE CALENDAR YEAR 1916.

By J. S. McLeish, Mines Branch, Ottawa.

The total value of the metal and mineral production in 1916 as shown in the preliminary report presented herewith was \$177,357,454, which compared with a production in 1915 valued at \$137,109,171, shows an increase of \$40,248,283, or 29.3 per cent. The previous maximum production was \$145,634,812 in 1913.

In presenting a total valuation of the mineral production as is here given, it should be explained that the production of the metals copper, gold, lead, nickel, silver, and zinc is given as far as possible on the basis of the quantities of metals recovered in smelters, and the total quantities in each case are valued at the average market price of the refined metal in a recognized market. There is thus included in some cases the values that have accrued in the smelting or refining of metals outside of Canada.

The war has had a most pronounced effect not only in stimulating the production of those metals such as nickel, copper and zinc, iron and steel, molybdenum, etc., which are used so extensively for war purposes, but also in increasing the production of other products such as chromite and magnesite which can only now be obtained with difficulty if at all from sources previously available. The general industrial activity in metallurgical operations and in the manufacture generally of munitions of all kinds, including the freight movements required, have in turn increased the demand for fuel which has been met in Western Canada at least by large increases in coal production.

Increased production in quantity has in most instances been accompanied by large increases in prices, thus further enhancing the total value of the production.

Considerable progress has been made during the year in establishing and increasing smelting and refining capacities of which the installation of electrolytic zinc and copper refineries at Trail and the beginning of construction of a nickel refinery at Port Colborne, Ont., are conspicuous examples. In addition, mention should be made of the production of metallic magnesium at Shawinigan Falls, of ferro-molybdenum at Orillia and Belleville, of metallic arsenic at Thorold, and of stellite, the cobalt alloy for high speed tool metal, at Deloro, and of the increased capacity for the production of steel particularly the installation of electric furnaces.

The mining output has been restricted and the efficiency of its operation considerably reduced by the withdrawal for war service of such a large proportion of the more highly experienced labor and engineering supervision. Higher costs have tended to offset the advantages to be derived from higher prices of output and in the case of gold mining have been a distinct burden.

The mining and metallurgical industries include a great variety of products so that in dealing with the industry as a whole the total value presents the only means of comparison, nevertheless quantities of production and prices are at all times the items of essential importance.

The accompanying statistical table shows the detailed production in 1916.

There has been an increased production of nearly all metals with the exception of lead and silver. The

total value of the metallic production in 1916 was \$107,040,035, as compared with \$75,814,841 in 1915, an increase of \$31,225,194 or 41.2 per cent.

## The Mineral Production of Canada in 1916.

(Subject to Revision.)

| Metallic Products.                                      |             |               |
|---------------------------------------------------------|-------------|---------------|
|                                                         | Quantity.   | Value.        |
| Antimony ore (exports), tons*.....                      | 794         | \$ 48,158     |
| Cobalt metallic and contained in oxide, etc., lbs. .... | 841,859     | 926,045       |
| Copper, value at 27.202c per lb., lbs....               | 119,770,814 | 32,580,057    |
| Gold, oz. ....                                          | 926,963     | 19,162,025    |
| Iron, pig from Canadian ore, tons..                     | 115,691     | 1,328,595     |
| Iron, ore sold for export, tons.....                    | 140,608     | 393,689       |
| Lead, value at 8.513c per lb., lbs.....                 | 41,593,680  | 3,540,870     |
| Molybdenite, contents at \$1 per lb., lbs.              | 159,000     | 159,000       |
| Nickel, value at 35c per lb., lbs.....                  | 82,958,564  | 29,035,497    |
| Platinum, oz. ....                                      | 15          | 600           |
| Silver, value at 65.661c per oz., oz....                | 25,669,172  | 16,854,635    |
| Zinc, value at 12.804c per lb., lbs.....                | 23,515,030  | 3,010,864     |
| Total. ....                                             |             | \$107,040,035 |

| Non-Metallic Products.            |            |              |
|-----------------------------------|------------|--------------|
| Actinolite, tons .....            | 250        | 2,750        |
| Arsenic, white, tons .....        | 2,186      | 262,349      |
| Asbestos, tons .....              | 136,016    | 5,133,332    |
| Asbestic, tons .....              | 18,500     | 27,147       |
| Chromite, crude ore**, tons ..... | 27,030     | 299,753      |
| Coal,† tons .....                 | 14,428,278 | 38,797,437   |
| Corundum, tons .....              | 67         | 10,307       |
| Feldspar, tons .....              | 19,166     | 71,357       |
| Fluorspar, tons .....             | 1,284      | 10,238       |
| Graphite, tons .....              | 3,971      | 285,362      |
| Grindstone, tons .....            | 3,328      | 50,982       |
| Gypsum, tons .....                | 341,618    | 730,831      |
| Magnesite, tons .....             | 55,413     | 563,829      |
| Manganese, tons .....             | 979        | 90,791       |
| Mica, tons .....                  | 914        | 122,541      |
| Mineral pigments—                 |            |              |
| Barytes, tons .....               | 1,368      | 19,393       |
| Oxides, tons .....                | 8,811      | 58,711       |
| Mineral water .....               |            | 114,587      |
| Natural gas, M. cu. ft. ....      | 25,238,568 | 3,924,632    |
| Peat, tons .....                  | 300        | 1,500        |
| Petroleum, barrels .....          | 198,123    | 392,284      |
| Phosphate, tons .....             | 203        | 2,514        |
| Pyrites, tons .....               | 309,411    | 1,084,019    |
| Quartz, tons .....                | 135,803    | 241,806      |
| Salt, tons .....                  | 124,033    | 668,627      |
| Talc, tons .....                  | 10,651     | 36,475       |
| Tripolite, tons .....             | 620        | 12,139       |
| Total. ....                       |            | \$53,015,693 |

| Structural Materials and Clay Products.        |            |              |
|------------------------------------------------|------------|--------------|
| Cement, Portland, barrels .....                | 5,359,050  | 6,529,861    |
| Clay products—                                 |            |              |
| Brick: common, pressed, paving..               |            | 2,358,245    |
| Sewer pipe .....                               |            | 716,287      |
| Tile, pottery, refractories.....               |            | 1,104,901    |
| Kaolin, tons .....                             | 1,750      | 17,500       |
| Lime, bushels .....                            | 5,482,876  | 1,089,505    |
| Sand and gravel (not complete)‡....            |            | 1,498,009    |
| Sand-lime brick .....                          | 13,825,307 | 113,136      |
| Slate, squares .....                           | 1,262      | 6,223        |
| Stone—                                         |            |              |
| Granite. ....                                  |            | 1,277,019    |
| Limestone .....                                |            | 2,326,519    |
| Marble. ....                                   |            | 118,810      |
| Sandstone. ....                                |            | 145,711      |
| Total structural materials and clay products.. |            | \$17,301,726 |
| All other non-metallic .....                   |            | 53,015,693   |
| Total value, metallic .....                    |            | 107,040,035  |

Grand total, 1916 ..... \$177,357,454

\* Tons of 2,000 lbs

\*\* Ore and concentrates finally marketed estimated as 13,834 tons.

† Additional returns increase production to 14,461,678 tons, \$38,857,557.

‡ Additional returns increase value to \$1,734,183.



**LILLOOET, BRITISH COLUMBIA.**

In his "Preliminary Review" for 1916, the Provincial Mineralogist gives the following information relative to mining in Lillooet district of British Columbia:

The Cadwallader Creek camp is the most important part of the Lillooet mining division, and an important productive lode-gold mining camp. It is by the present route, via Mission mountain, about fifty-five miles from the Pacific Great Eastern Railway, and about seventy miles from the town of Lillooet. A good auto-road connects the camp with Mission station.

During 1916 there has been more activity on Cadwallader creek than during previous years, and the production has been larger. Three mills have been running practically continuously from early in June until November.

The Lorne, Pioneer, Coronation, and Wayside mines have each been actively operated, and the three first mentioned have produced satisfactory returns.

The Lorne group has been operated by A. P. Noel, of Lillooet, under a bond from the owners, the Lorne Amalgamated Mining Company. He has had about ten or twelve men at work, and has continued the main adit, which was started some years ago, until he has reached an ore-body at about 250 ft. below the upper workings, from which ore was mined and treated in an arrastra in 1900. In future this adit, which is a crosseut about 400 ft. long, will be the main haulage-way from the mine-workings to the 5-stamp mill, the portal of the adit being at a slightly higher elevation than the grizzly and ore-bin at the mill. The mill was operated from June until November, and was only closed down because of breaking of the camshaft, otherwise Mr. Noel intended to attempt to continue operations during the winter and establish a record. The cost of mining and milling is reliably reported to have been as low as \$4.60 a ton, and the average gold content saved from the ore somewhere about \$10 a ton.

The Coronation mine has been worked most of the year by B. Perry under a lease from the Coronation Mining Company, but near the end of the year the company made a deal with George H. Alyard, the managing director of the Standard Silver-Lead Mining Company, who has taken over the property and will operate it in future. The work done during the past season was principally confined to further development on the Countless mineral claim, one of the group contained in the property. The development-work is reported to show an increase in the width of the vein in the drift from about 8 in. to nearly 5 ft. of ore that assays high in gold. An assay from the narrow part of the vein is reported by Mr. Alyard as showing 4 oz. gold to the ton.

The 10-stamp mill at the Coronation mine was operated only a portion of last season, treating ore from the old stopes on the Little Joe mineral claim of the group, also ore sorted from the old dumps, all of which is reported to have yielded fair returns, especially considering that the old plates in the mill were in very poor condition, and consequently much gold was lost in the tailings.

The Pioneer Mining Company operated the Pioneer mine continuously during 1916. A sawmill, run by steam-power, capacity 1,000 ft. B.M.; Lane mill, capacity about 15 tons a day; rock-crusher; air-com-

pressor, capacity six drills; hoist and pump, driven from the air-compressor, were installed and operated continuously from June last. The mill, compressor, and rock-crusher are run by water-power, developed by a dam and flume a quarter of a mile long. An upraise was made from the old adit level to the surface, and connected with a winze from the adit level sunk to a depth of 100 ft. with stations opened at 50-ft. and 100-ft. levels below the adit. Drifts were driven to the east and west for about 80 ft. on each level and stopes opened. About 1,500 tons of ore was mined and milled during the season. The yield is reported as very satisfactory, especially from the lower west drift, the face of which is said to show a width of 5 ft. of ore that was carried for several feet east from the face. The total amount of gold saved in the mill is reported as \$32,500.

The Wayside mine has been further developed by D. C. Paxton, the owner, who has continued driving on the No. 4 adit until its total length is 350 ft., also on the No. 6 adit to a total length of 125 ft. These adits appear to be driven on parallel veins, and a good grade of gold-bearing quartz is exposed in both. At the face of the No. 4 adit the vein is 5 ft. wide and pans well.

The Golden Dream Mining Company has been prospecting the gravel-deposits on the south fork of Bridge river below the dam, and sluicing the material taken from a pit in which bed-rock was struck at 21 ft. C. P. Dam, the manager, installed an Empire drill early in the season, but owing to the boulders it was not a success. Later these operations were abandoned, and two serapers, worked by water-power from an overshot wheel, were substituted and worked satisfactorily. About one-third of the gravel taken from the pit yielded between 35 and 40 cents to the cubic yard, saved in the sluice-boxes.

The usual assessment-work was done on those mineral claims in the camp that are not yet Crown-granted, of which there are not many, as most of the claims were staked in 1897, 1898 and 1899, and the owners acquired Crown grants some years ago.

The opening of the Pacific Great Eastern Railway has proved a great advantage to the camps in the Lillooet mining division, as previous to that event the district was so remote from rail transportation that the excessive freight rates retarded progress.

**Molybdenite Ore.**—During 1916 a shipment of molybdenite ore was made from mineral claims on Texas creek, a tributary of the Fraser river that empties into it on the west side about twenty miles south from Lillooet station, on the Canadian Northern Pacific Railway. The shipment contained 9 tons of molybdenite which carried 16 per cent. molybdenite. The operators of this property are greatly handicapped because of remoteness from transportation and rough trail from the claims to the Lillooet wagon-road.

**Talc.**—Two cars of talc was shipped during 1916 from the near shore of Anderson lake, near the mouth of McGillivray creek.

Early in February most of the flotation concentration plant at the Highland Valley Mining and Development Co.'s concentrating mill, in the Ashcroft mining division, was in operation. An account of the company's property was printed in the Journal of January 1, page 21.



### FRENCH'S ZINC TREATMENT PROCESS.

On February 15 the "Daily Times," Victoria, British Columbia, published the following:

The plant of the French's Complex Ore Reduction Company at Nelson will be ready for operation in about one month, on the arrival of the sheet rolling mill from the manufacturers, says Thomas French, son of the late Andrew Gordon French, the originator of this system of ore treatment, who is now in Victoria.

Mr. French says that the plant has been constructed at a cost of \$36,000, the B. C. Government having guaranteed up to \$40,000 and being secured by a first charge which the directors hope to lift soon after operations are started. He explained that a considerable quantity of ore is in sight, and on such favorable terms as to warrant the sanguine expectations of the promoters. As one who has devoted years as a scientific enthusiast to the completion of the French ideas and patents for dealing with difficult zinc and similar ores, Mr. French not only believes in his patents but is confident they can be employed on a large scale commercially.

"We have got beyond the experimental stage," he said, "and this plant is a commercial demonstration of what can be done with ores from hundreds of small mines in the Kootenays which have hitherto resisted treatment. All the zinc we produce will be taken by the Munitions Board, and we have other avenues of disposal which promise profitable results to the producer."

From what Mr. French said it is clear that other mining concerns and promoters appreciate what the company possesses in its potential development, since he explained that numbers of people representing most influential interests were "biting" at the proposition to secure control; however, he added that the company intended to itself prove the value of the process in practice.

He impressed on the interviewer that the character of the constituents of the ores to be treated is all important, in the deposition of the purest zinc, and as the manganese, a constituent on whose presence the success of the process depends, may be of very limited percentage, severe tests of the efficiency of the process are thereby provided.

Mr. French briefly alluded to his experiments at Trail, on the Sullivan mine ore, and at Silverton of the Standard property's product, and stated that the percentage of zinc extracted depended on the character of the concentrates. At Silverton tests were made on ores ranging from mill feed containing 10 per cent. zinc up to zinc concentrates with 43 per cent. zinc. A test was made with a concentrate containing 32.2 per cent. zinc, 3.5 per cent. lead and 31.6 oz. silver to the ton. After the zinc was extracted its lead and zinc content increased to 8.7 per cent, and 76 oz. to the ton. The extraction of zinc amounted to 91.5 per cent. of that in the ore. Mr. French adds that his average is about 92 per cent.

In the course of the "Speech from the Throne," delivered by His Honor the Lieutenant-Governor on the occasion of the opening of the Legislative Assembly of British Columbia on March 1, the following reference was made to the mining industry of that Province: "The increase in the demand for metals caused

by the War has given new impetus to mining operations, and legislation will be introduced providing assistance for systematic prospecting of the mineral-bearing districts of the Province. To meet the growing demand of the mining industry, you will be asked to consider the advisability of providing additional smelting facilities."

### THE LAKE SHORE MINE, KIRKLAND LAKE.

The following summary of work done at the Lake Shore gold mine is contained in a recent report to the shareholders by manager J. W. Morrison:

At the beginning of 1916, the shaft had reached to a depth of about 300 feet, and our development, during the early part of the year, was confined to the 300 foot level.

The ore shoot on this level, encountered 68 feet west of the shaft, yielded a very low grade of ore for the first 40 feet. At that point the values increased, giving a good milling ore for about 70 feet in length. Further development along the vein promised nothing of value. In a cross-cut to the north, another vein was encountered, which later proved to be the north branch of the vein we developed. This gave an ore shoot 176 feet in length of good milling ore, making a total length of about 250 feet of milling ore on that level.

It was decided in June, 1916, that a larger plant should be installed to continue work. Consequently, underground work ceased the latter part of June, and the laying of foundations and the erection of buildings for the new plant were begun.

With proper delivery of machinery, mining operations would have been resumed early in September, but in consequence of slow delivery, the plant was not started until late in October. The installation consists of a 740 cubic ft. combination electric and steam driven compressor; a 10 in. by 12 in. hoisting engine; a 125 h.p. return tubular boiler; a 125 h. p. induction motor, with transformers of same capacity and general small equipment. A good head frame was erected and the shaft fitted up and cage installed. New buildings were erected and covered with fire-proof material. Though comparatively small, the plant is complete and is capable of doing economic work.

Upon resuming underground work in November, a raise was started from the 300 foot level and is now in progress. The face of the 100 foot level, west, is being driven, as also is the west face of the 300. No ore of consequence was passed through on the 100 foot level, but the face of the 300 is still in good ore.

800 feet of drifting, 160 feet of cross-cutting, and 35 feet of raising were done on the 300 foot level during the year. No further development was done on the 200 foot level; but about 100 feet of drifting was done on the 100 foot level. There is estimated to be about \$300,000 worth of ore above the 300 foot level, in the present developed ore shoot.

The above report covers operations from January 1st to November 30th, 1916. Since that time, there has been developed, in addition, approximately \$150,000 worth of ore. The ore will average between \$16 and \$18 per ton and has a stoping width of about 4 feet.



**GOLD AND THE NEED OF CYANIDE.**

In the course of a comprehensive paper on "Pacific-Northwest Minerals in Peace and War," which was read before the Northwest Mining Convention at Spokane, Washington, on February 21, Mr. Frank A. Ross, of Spokane, consulting engineer, formerly general manager for the Marcus Daly Estate of the Nickel Plate group of gold mines and 40-stamp mill and cyaniding plant in Camp Hedley, B.C., made the following observations relative to gold and cyanide:

"Gold, our present standard of values, is unique among metals because its price always remains the same—\$20.67 per fine oz.—and because the profit derivable from gold ores is greater in times of adversity than in prosperity, which latter always increases costs. Owing to this fact, that is because of the increased cost of production under the high prices of labor and materials of the last two years, the domestic production of gold fell from \$101,000,000 in 1915 to a little more than \$92,000,000 in 1916, and the world's production will show proportionately a much heavier decrease as soon as the statistics shall be available.

"A striking instance of our unpreparedness and our dependence upon foreign countries is found in the shortage of cyanide, upon which our gold industry now relies for economical production, and to which the decrease in output is largely due.

"As most of you know, solutions of potassium—or sodium—cyanide necessary in any case is an important factor in the cost of production. Before the War, cyanide was worth from 18 cents to 22 cents a pound in the Northwest; now it is so scarce, at \$1.15 a pound, that a number of mines have been closed and the remainder are working at a great disadvantage. The same is true of those silver properties that use cyanide. And yet we have right at our doors all the 'makings' of cyanide in quantities to supply the world. These consist of abundant lime, coke, and electric current, together with plenty of fresh air. Limestone is first burned to make quicklime which is then crushed and mixed with fine coke, fed to an electric furnace, fused at a temperature of about 2,600 deg. centigrade, poured into moulds, and then pulverized. This product is called carbide. Liquid air is then fractionally distilled at a temperature of about 190 deg. below zero and the nitrogen is driven off and collected, the carbide is then heated, and the nitrogen is passed over it, forming what is known as cyanamide-calcium-carbon-nitrogen compound from which sodium, or potassium, cyanide is then made. Cyanamide is also very valuable in the making of fertilizers, while cyanide is extensively used for a number of purposes, California alone consuming more than 1,800 tons annually as an insecticide. So that, some day, you will see this chemical industry firmly established here."

From the Merritt Herald it is learned that the first carload of machinery for the Donohoe Mines Corporation's concentrator has arrived in Nicola Valley. The site on which the mill is to be erected has been prepared and building materials are on the ground in readiness for construction work. Stoping is in progress on the 200-ft. level of the company's Joshua mine and ore of good grade is being hoisted. It is stated that there is sufficient ore on the dump to keep the concentrating plant supplied uninterruptedly for several months.

**THE ELECTROLYTIC PROCESS OF ZINC RECOVERY.**

The production of zinc by the electrolytic process is now well established in Canada and the United States. Those in charge of the plants state that the success is such that operations will be carried on profitably in normal times as well as in the present period of high prices.

In a paper presented at the annual meeting of the Canadian Mining Institute last week Mr. E. P. Mathewson said of the process in use at Anaconda:

"During the course of the experiment and during the trials in the test plant at Anaconda the process originally proposed by Messrs. Laist and Frick was much simplified. The process finally adopted consists essentially of the following steps: First careful roasting of the concentrate at temperatures not exceeding about 730 degrees centigrade; then dissolving the zinc together with a little iron by means of spent electrolyte in Pachuea tanks. A small amount of manganese dioxide is then added to effect the oxidation of the iron, which is then precipitated by means of powdered limestone, bringing down any arsenic or antimony that may be dissolved. These are separated in Oliver filters, and the residue sent to the blast furnaces, while the filtrate, which contains nothing but zinc with a little cadmium and copper, is then treated with zinc dust and again filtered, the filtrate being the pure solution which is sent to the tank room. The anodes are pure lead and the cathodes pure aluminum. The deposition goes on for 48 hours only, when the zinc is stripped from the cathode sheets, then melted into slabs."

**ONTARIO'S NON-METALLIC PRODUCTS.**

The summary report of the Deputy Minister of Mines of Ontario shows for 1916 an increase in production of non-metallic minerals: Arsenic, fluorspar, graphite, iron pyrites, mica, petroleum, quartz, salt, sand and gravel, talc, are the chief minerals of this class produced in Ontario.

There has been a decline in the output of clay products, but the value per thousand of brick has risen. Common brick in 1916 averaged \$8.53 per thousand at the works, as compared with \$7.96 in 1915. The explanation can be traced to scarcity of labor, higher wages and increased fuel costs. Porous hollow tile, used chiefly for flooring and wall construction in structural steel buildings, is increasing in importance, and Ontario clay workers are now making a high-class product. Cement tile manufacturing is increasing in importance. Last year 1,431 M. tile were produced, valued at \$39,131. There was an increased production of natural gas, but the value has declined. An increase in industrial, and a decrease in domestic, consumption explains this situation, which is by no means ideal from the standpoint of conservation. Shipments of iron pyrites from two new sources were made in 1916, namely, by the Rand Syndicate, whose property is three miles west of Timagami, and by the Madoc Mining Company from the Goudreau mine on the Algoma Central railway. The last mentioned made larger shipments than any other pyrite mine in the Province.



## ANNUAL MEETING CANADIAN MINING INSTITUTE.

The sixteenth annual meeting of the Canadian Mining Institute was held in the Ritz Carlton Hotel, Montreal, March 7th, 8th and 9th. Technical sessions were held on Wednesday and Thursday, the program being as follows:

### Wednesday, March 7th.

Morning Session: 10 a.m. to 1 p.m.

Presidential address, by Mr. Arthur A. Cole.

"Organization for Industrial Preparedness," by Mr. E. P. Mathewson.

"The Work of the Honorary Advisory Council for Scientific and Industrial Research," by Dr. Frank D. Adams.

"A Plea for Definite Training for Social Responsibility by Means of Our Educational Institutions," by Mr. C. V. Corless.

"Possibilities for Manufacture of Cyanide in Canada," embodying a report prepared by a special committee of the local Section of the Society of Chemical Industry, by Mr. Gordon Spencer.

"Electro-Chemical and Metallurgical Possibilities in Canada," by Mr. H. E. Howe.

Afternoon Session: 2.30 p.m. to 6 p.m.

"The Development of Canadian Magnesite," by Mr. H. J. Roast.

"Canadian Magnesite and Its Uses," by Mr. H. J. Ross.

"Potash, Its Production and Uses," by Mr. C. W. Drury.

"The Concentration and Marketing of Canadian Molybdenite," by Mr. H. H. Claudet.

"Utilization of Canadian Molybdenite," by Mr. J. W. Evans.

"Notes on the Orillia Molybdenum Company's Concentrator and Refinery," by Mr. G. P. Grant.

"Pulverized Fuel for Locomotives," by Mr. J. S. Coffin.

"Canada in Relation to the Coal Trade of the Empire," by Mr. Allan Greenwell.

Evening Session: 7.30 to 10 p.m.

"Further Notes on Yukon Mining Problems," by Dr. Henry M. Payne.

"Preparedness Among Animals," by Dr. Alfred C. Lane.

"Alaskan Physiographic Features," illustrated by motion pictures, by Mr. H. W. DuBois.

### Thursday, March 8th.

Morning Session: 10 a.m. to 1 p.m.

"Electrolytic Deposition of Zinc From Aqueous Solutions," by Mr. E. P. Mathewson.

"Electro Zinc in Eastern Canada," by Mr. E. E. Watts.

"The Kingdom Lead Mine," by Mr. John E. Hardman.

"The Future of the Iron and Steel Industry in Canada," a symposium by Dr. Alfred Stansfield, Mr. D. H. McDougall, Mr. Corbett F. Whitton, Mr. G. C. Mackenzie, and Mr. R. R. Hedley.

"Mining Methods at the Magpie Mine," by Mr. A. Hasselbring.

"The Occurrence and Testing of Moulding Sands," by Mr. L. H. Cole.

"Refractory Clays of Saskatchewan," by Mr. N. B. Davis.

"Notes on Milling Practice at the McIntyre Mine," by Mr. A. Dorfman.

"Counter-Current Decantation," by Mr. L. B. Eames.

"Milling Practice at the Buffalo Mines, Ltd.," by Mr. Robt. E. Dye.

"Flotation by the Callow Process in the Cobalt District," by Mr. John M. Callow and Mr. E. B. Thornhill.

"Flotation Experiments with Canadian Wood Oils," by Mr. C. S. Parsons.

"Partridge Furnace: Its Uses and Adaptability," by Mr. Allen R. Partridge.

"The Chromite Deposits of Quebec," by Dr. Robt. Harvie.

### Friday, March 9th.

Visit to Munition Works.

By the courtesy of the officials of the Dominion Bridge Company and affiliated companies, namely, the Montreal Ammunition Co., and the Dominion Products Co., and also of the Canadian Vickers Ltd., members were afforded the opportunity of visiting the munition plants of these concerns.

A few of the papers had been printed and copies were distributed among those present. The rights of publication are reserved.

President Cole in his address pointed out the "crying need of effort and co-operation between the various agencies and organizations of the Dominion in the important work of striving to place the Dominion in a more satisfactory condition than that which she has occupied up to the present of being a hewer of wood and a drawer of water for the United States."

"We have enormous masses of information buried in different governmental departments, both Federal and Provincial, in our universities and private offices, but up to the present we have no one with power and initiative enough to make it valuable for practical purposes," he continued. "In many cases we have in governmental departments excellently qualified men who should be recognized as leaders in their respective fields. If those in charge cannot do the work required, let us get the men who can."

"As engineers we have a duty to perform for Canada," said E. P. Mathewson in his paper on "Organization for Industrial Preparedness." "That duty is," he continued "to advise the Government as to the necessity of compiling the proper statistics regarding all industries in this country. If we had done our duty a little earlier we would have been better prepared for the great struggle that is now nearing its termination. Now, however, we can redeem ourselves to a certain extent by advising the Government how to prepare for peace. Statistics should be compiled showing in detail all the important facts and figures concerning the various industries of Canada as at present existing; and at the same time these should be supplemented by additional statements setting forth the possibilities for extensions in old lines and for the beginning of enterprises along new lines.

"It has come to my knowledge from a very authentic source that the statistics prepared in Canada today are based on insufficient data and that one department after another in the Government takes the same data, re-hashes it and serves it up with a little different trimmings as matter originating in the particular department furnishing the report. I have been told that over 30 per cent. of the statistics published by various departments in Ottawa are absolutely copied verbatim one from the other and that the balance of the figures are merely a rearrangement of the same figures. This is not only a great waste of



time and money, but it is hindering the development of Canada.

"I suggest, therefore, that this institute recommend the Government to appoint a special Statistical Board from the employees of the Bureau of Mines, the Geological Survey, the Department of Labor, the Internal Revenue Department, and the Census Bureau to gather and compile the necessary data concerning all the industries of Canada, to publish yearly reports thereon, and to add to these reports each year statistics indicating possible openings for the establishment of new industries. If such a board were appointed it might require assistance for the first year or so from the members of the engineering societies of Canada. This, I believe, would be freely granted, as was done in the United States during 1916, when the entire industry of the great country was canvassed, without any cost to the American Government, and statistics prepared which were of such great value that the Government took steps to ensure that the information should thereafter be kept constantly up to date. In order to know what we can do, we must first know on what tools and on what men we can count for such work as there may be to do."

Education along social lines was the subject of a paper read by C. V. Corless. He said in part:

"We have developed social conditions in which, to a large extent, privilege and responsibility have become dis-associated, in which rights rather than duties are mainly insisted upon, in which conduct is, to a far too great extent, restrained by law and police rather than by ethical principles. We have evolved an educational system in which an attempt is made to develop the minds of the young by feeding them almost exclusively on husks and symbols of knowledge—language and number—whereas the basis of real mental growth and vigor is almost entirely overlooked.

"We are only now beginning to realize that it is one of the highest duties of the State to train the citizen to become efficient producers of the world's needs, whether of goods or of services.

"We have been trained under an educational system practically ignoring social science. Is it any wonder that we have reached our present period of life with views not clearly defined on social and economic questions? We now realize that here is a vast field of the very first importance, regarding which even most of our legislators have most inadequate knowledge.

"The most efficient citizen is he who fully realizes his interrelations to other members of society, who knows that his personal welfare is inseparable from that of his fellows. The quickest way to increase social consciousness is definitely to introduce a thorough social training into our educational system."

A feature of the banquet was the presentation by a delegation of the Mining and Metallurgical Society of America to Edward Payson Mathewson, born in Montreal and a graduate of McGill University, with the annual gold medal in recognition of his outstanding research work and "distinguished services" in metallurgy. Mr. Ingalls briefly sketched the career of Edward Payson Mathewson. After graduation, Mr. Mathewson was assayer and later superintendent of the Pueblo Smelting and Refining Company, 1886-1897. Here he showed a spirit of investigation and research which resulted in improvements in lead smelting. From 1897 till 1902, he was a member of the

Guggenheim technical staff, at first superintendent and later general manager at Perth Amboy, N. J., where he greatly improved lead smelting practice. Later he was sent to Mexico, and to Chile.

From 1902 to 1916 Mr. Mathewson was connected with the Anaconda Copper Company, first as superintendent of blast furnaces and later as manager of the entire plant. Here he made many improvements in copper smelting.

In 1911 he received the gold medal of the Institute of Mining and Metallurgy of Great Britain. He is now manager of the British America Nickel Company with head office in Toronto.

In responding, Mr. Mathewson deprecated his own work and said that any success he had attained had been through his ability to choose good assistants and his good fortune in always being connected with corporations sufficiently prosperous to encourage extensive research work. He had gained much too from conversation with workmen about the plants and he encouraged all his hearers to seek out the workmen and talk with them.

The importance of a revival in the sense of responsibility in public affairs and Government was suggested by J. W. Flavelle, Chairman of the British Munitions Board. In the development of the material, he said the tendency has been to specialize and to leave to others the attention to the Government. Even the King's Counsel has given up his broad interests to become Counsel for a corporation. Other professional and business men specialized in their work.

This neglect of a broader education, he considered to be due to the passing of the winter lecture courses in the country stores where men were wont to meet, swap stories and to talk politics. Now, men meet in smokers at the club, talk patronage and how to win elections. The plain fact was men were staying out of politics because they were unwilling to pay the price.

"What right have we to stand aside from affairs of government whilst these men are laying down their lives for us," said he. And he quoted from a speech by Lloyd George in which the British Premier said that the community has the right to the best that each member can give, not as a privilege, but as a right.

H. Mortimer-Lamb, secretary, read a telegram of acceptance from Herbert Hoover, who had been asked to become an honorary member of the Institute.

Lient.-Col. Caldwell and Edgar Rickard spoke in appreciation of the great work accomplished by Canadian mining engineers at the front. Their efficiency is proved in the honors they have won.

H. Payne, of the American Mining Congress, and P. N. Moore, of the American Institute of Mining Engineers, brought greetings.

Following are the officers elected by the Canadian Mining Institute: President, Arthur A. Cole; vice-presidents, Charles Fergie, Thos. W. Gibson, D. B. Dowling, M. E. Purcell; councillors: Nova Scotia, F. W. Sexton; Quebec, L. D. Adams, T. Denis and Dr. A. Stansfield; Ontario, E. P. Mathewson, R. E. Hore, N. R. Fisher, J. V. Stovel, Clifford E. Smith, M. Summerhayes, W. E. Segsworth, W. J. Dick, G. C. Mackenzie, and M. B. Baker; Alberta: W. A. Davidson, W. F. McNeill, and N. A. Pitcher; British Columbia: G. P. Jones, E. E. Campbell and Thomas Graham.



## UTILIZATION OF PEAT FOR THE PRODUCTION OF SULPHATE OF AMMONIA AND OF POWER.\*

By Louis Simpson.\*\*

An industry, to be a commercial success, must have its manufacturing plant properly planned, equipped, and operated. Unless the lay-out and equipment are done economically and efficiently, even the most careful management will not be able to secure the financial returns anticipated.

Up to date, the manufacture of peat fuel from the peat bogs of Canada has resulted in one long series of failures. Fortunately, all these failures carry with them, plainly indicated, the causes that were responsible for disaster. That the manufacture of peat fuel can be profitably carried on, when the conditions are favorable, and when the operating plant is properly laid out and equipped, is evident from the rapid extension of the peat industry in certain European countries.

One mistake made in the past was the endeavor to build up an industry which had for its aim the manufacture and supply of peat fuel for domestic purposes only. Peat being a very bulky fuel, the railways have demanded for its transportation rates that add materially to the laid down cost. The unloading and cartage expenses are also very heavy. Further, peat, when intended for domestic fuel, can be excavated and cured in Canada only during four months each year. Therefore, unless the manufacture be coupled to some other industry, operating during the whole year, the overhead charges for management, power, development, and skilled labor for repairs, etc., are altogether out of proportion to the value of the product. Any worth while attempt to reduce these charges invites disaster.

But the difficulties above mentioned are eliminated if a peat-bog is directly utilized in connection with a power plant, in which gas engines are driven by gas from peat produced in gas producers, or in which turbine engines are driven by steam generated from peat burned under steam boilers: both being directly connected to electric generators for the development of electric energy; or, where the gas produced from the peat is conveyed by pipe lines for utilization as power for manufacturing processes in the neighborhood, or utilized for domestic purposes—such as heating and cooking—in the homes of the people.

Moreover, in addition to the profits derived from the direct use of the gas produced from the peat, still further gains can be made from commercial by-products to be obtained from the so-called waste gases. These by-products include sulphate of ammonia, tar of valuable quality, and an ash not to be despised. The ash can be utilized directly as a fertilizer, or as a filler for other fertilizers.

The amount capable of being realized from the sale of these by-products—providing the peat bogs are of the right quality—will not only pay all expenses (including depreciation and amortization) involved in the manufacture of the peat fuel, but will also pay the expenses incurred in the development of the initial power, and in the operations of the by-product saving process. Hence, after deducting these incidental expenses from the returns obtained from the sale of the by-products, there will remain to the credit of profit—apart from the market value of the electric energy distributed, and the gas sold for power, manu-

facturing processes, and domestic uses—a very substantial cash balance.

Inasmuch as up-to-date useable knowledge of the manufacture of peat fuel, in a form desired by a busy man, is not available, the following description and data are given.

### Excavation of Peat.

A modern excavator, when erected and ready for operation, occupies a space (exclusive of the space occupied by the excavating buckets), 35 ft. long x 24 ft. wide, approximately. It stands upon flanged wheels, which rest upon a track of three rails: the distance between the centres of the two outside rails being 12 ft. The rails are of 60-lb. section, used in lengths of 13 3-4 ft., and are placed parallel to the long sides, when extended, of the cut being made. As the bog is excavated, the front length of rails are removed, and transferred behind the excavator, which is, from time to time, drawn back to permit the continuance of the excavation process. The excavator buckets work up the face of the bog from the desired depth, and after taking a cut, the buckets are moved sideways to the next position, to take another cut, and so on to the end of the face. When the end is reached, this side movement of the buckets is reversed. The angle or dip of the face is governed by the depth it is desired to excavate.

The distance the excavator is moved back from the face, without stoppage for relocation, is 13 3-4 ft. The time thus lost in making each of these necessary changes should not exceed 8 minutes. When excavating at the depth of 10 ft., the excavator should excavate a section 13 3-4 ft. x 28 ft. x 10 ft., in less than 52 minutes, which, with the 8 minutes lost in relocation, makes one hour, as the total time required to excavate one section of the dimensions indicated. Such a section contains 3,850 cubic ft. Bog peat weighs 66 pounds per cubic ft., hence the weight of a section will be 254,100 pounds, or 127 short tons, equivalent to 29 tons of 65 per cent. peat.

The buckets deliver the peat into a storage hopper of 5 tons capacity. From this hopper the peat is taken to the feeder connected to the macerator. This feeder should be so designed that unseen metallic substances, such as iron, would be magnetically extracted; while oversized roots should be removed mechanically, or by hand; in fact the macerator should be so made as to be "fool proof."

The emulsified peat is then discharged into a storage hopper capable of holding 5 tons, or more, of bog peat. This hopper should be so constructed that not more than a predetermined quantity of peat can be delivered from it, to a distribution car, at any one time.

In Canada, it has not hitherto been customary to operate the excavator up to its capacity, or to anywhere near capacity. Great losses resulted from such methods. An industrial production engineer would condemn operations that only secured 40 per cent. of the possible. A careful scrutiny of the cost sheets of a peat plant, by any man experienced in the handling of men and machinery in a modern industrial plant, will show that the causes of this astounding loss of efficiency should, in most cases, never have occurred; and where they did occur, should have been remedied.

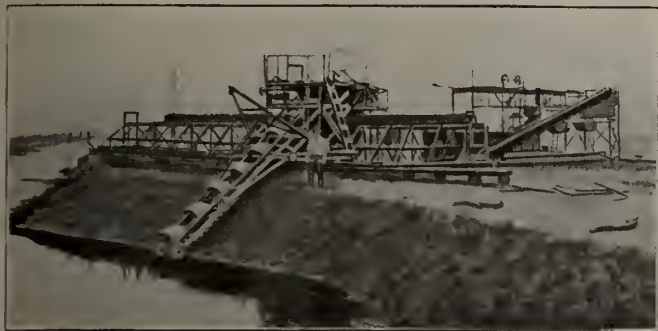
The excavator should be so designed that the location of the weight burden, whether caused by the machinery or by the peat contained in the two hoppers, and the stresses due to the work done by the

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\*\*Member American Electrochemical Society, Industrial Engineer.



excavator's buckets, should be so adjusted and distributed that the smooth working of the excavator is not interfered with. Further, the excavator should be so constructed that it is impossible for the elevator to leave its tracks, when it is being moved thereon.



THE ANREP EXCAVATOR

The excavator under review was equipped with one 45 E. H. P., A. C. motor. It would have been better had the excavator and the machinery operated directly from the excavator been so designed that the whole would require a 40 or 50 E. H. P. motor. This motor should be specially constructed for the work, since a "general service" motor is not suitable. The motor should be installed by a competent electrician.

The motor on the excavator drives the macerating machinery, dump cars, and spreading machines, while the conveying and spreading machinery are in some outfits driven otherwise.

The spreading ground, on which the macerated peat is distributed by the spreader for the purpose of being dried by exposure to the atmosphere, is located on one side of the excavator. The length of the spreading ground is dependent upon the depth of the peat being excavated. The area of the ground required for a bog 10 ft. deep would be less than 1050 superficial feet, to which must be added a strip between the spreading ground and the excavator, and a like strip at the opposite end of the spreading ground. The size of these strips is dependent upon the room required to relocate the spreader, etc.; but with one spreader should not total more than 100 sq. ft. In the event of more than one spreader being used, further allowance would have to be made.

The track upon which are run the dump cars required for delivering the emulsified peat to the spreader, or spreaders, is constructed of light, moveable, tram rails, laid down in the shape of a parallelogram; but with the corners rounded. The side next to the spreading ground, then being used by the spreader, is supplied with duplicate rails, and is so arranged that the side, last in use, can be moved back quickly and placed in a new position, so as to permit the spreader to lay peat upon a new strip of the spreading ground. The removal and relocation of this duplicate track is done while the cars are using the side in place; and should be secured in the required new position before the excavator and spreaders stop for relocating; so that during the surplus time made available by the necessary stoppage, there will only be the rounded corners to move and readjust, and the cables operating the dump cars connected up.

As already mentioned, the time required to relocate the spreader should not exceed 8 minutes; the time therefore that should be allowed to relocate the car tracks, and spreader, or spreaders, should not be longer than 8 minutes. At present, when the excavator reaches the end of the cut and has to be relo-

ated so that another cut can be made across the bog, much more time than 8 minutes is lost. For this reason arrangements, whenever possible, should be made whereby the excavator can be operated on one continuous cut during the entire season; so that the relocation can be done after the termination of the season's harvesting. If, however, this is not possible, then relocation should only occur twice, once in the middle of the season, and again after the harvesting season has terminated. Wherever this economy in the system of operating is possible, some modification of the existing moveable industrial track is called for. There should be no difficulty in arranging such modification and improvements. In the "Anrep" system the spreader is operated by cable from the excavator; whereas in the "Moore" system the spreader is operated by means of an electric trolley. A far more economic plan would have been to operate the spreader by means of a small gasoline motor. It is claimed that the "Moore" spreader operating at 7 ft. per minute, will lay down 34 individual strips 4 in. x 4 in., making an aggregate strip 11 ft. wide, at the rate of 26 1-2 cubic ft. per minute. And since bog peat weighs 66 pounds per cubic ft., it follows that this spreader should lay down 1749 pounds per minute. Allowing 8 minutes lost time per hour for relocation, the production per hour should be 90,948 pounds, or 45 1-2 short tons of bog peat; which is equivalent to 10 1-2 short tons of 65 per cent. peat per hour.

Seeing that the excavator is able to excavate 29 tons of 65 per cent. peat per hour, it is evident that one excavator should be able to supply three spreaders. Such an arrangement is quite practicable, by placing the spreaders on the ground, in tandem. If one is placed at one end of the spreading ground, the second would commence to operate at one-third down the ground; while the third would commence operations at an equal distance ahead of the second. By this scheme, one continuous track would be amply sufficient for the dump cars; but extra dump cars would be required. In this way the relocation of the spreaders would be more expeditiously accomplished. The saving in wages and in capital cost with the accompanying interest and depreciation charges which this economic change would ensure, justifies the engineer or peat expert in giving this suggested innovation the most careful consideration.

#### Preparation of the Ground.

Every season, before the ground becomes hardened by the frost, the surface of the bog area required for the next season's operations—whether for excavation or for spreading purposes—should be carefully prepared. By preparation is meant, the removal from the surface of the bog of all overgrowth, and of any visible roots of inconvenient dimensions. Further, that portion of the bog required for the next year's operations should be surface drained; while that part intended for spreading purposes should be roughly rolled. The finishing rolling should be done in the spring; immediately before the ground is to be used for spreading. Too much attention cannot be paid to intelligently planned surface drainage. Included in this preparatory work, is the location of all soft spots. These soft spots should receive special attention with a view to improving them, but in any case their location should be indicated by poles with flags. For operations on a large scale, a machine, (gasoline driven), specially constructed for this preparatory work, should be purchased. As far as possible, no horses nor cattle should be allowed on the



bog, as their tramping breaks up the surface, and interferes with surface drainage. For the same reason vehicles used should be provided with wheels having very wide tires. In some instances "creeper" attachments could be advantageously used.

#### **Suitable Size of Peat Bricks.**

Another economy would be a change in the size of the peat brick. The brick, as laid by the spreader, should be made of a size, the weight of which—at the time they are turned—is found to be the maximum weight a boy can turn, without lessening the number turned per hour. The dimensions of the brick made hitherto, (dictated entirely by the requirements of the domestic fuel trade), is 8 in. by 4 in. by 4 in. Such a brick made of 75 per cent. peat, averages in weight, 2 pounds. A brick of like dimensions, but of partially dried peat, say 35 per cent. peat and 65 per cent. moisture, will weigh 4.14 pounds. Experimental investigation will determine what size of brick, made of 35 per cent. peat, but weighing 8, 9, or 10 pounds, will prove to be the most economical in wages for turning and cubing. Having determined the most economical weight, there will be no difficulty in fixing the most suitable dimensions. Probably it will be found preferable not to increase the thickness, but to increase the length chiefly, and perhaps the breadth slightly. The bricks, as left by the spreader, lie on the field 10 days. They are then turned and lie, so turned, 10 days before being cubed. Once cubed, they can remain cubed for 7 days, and until it is convenient to remove them.

#### **Transportation of the Peat.**

The economic transportation of the dried peat to the bunkers over the gas producers at the power house, is the most difficult problem of all the many problems that surround the economic manufacture of peat fuel. It must be remembered that each peat fuel manufacturing plant, has necessarily its own particular system of transporting the air-dried peat to its destination. This is another reason why the excavator should be worked so as to give a production somewhere near its maximum capacity. To produce 80,000 tons of air-dried peat, under the old system of operating, there would be required 4 excavators, with 4 spreading grounds. Hence, it would not be a question of moving about 600 tons of peat per day—the production of 4 excavators operating on the old system; but the conveyance, each day, of a total of 600 tons of peat from four widely separated spreading grounds, with the peat located at the loading end being constantly shifted, thus making it practically impossible to use any of the numerous economic permanent loading devices.

The modern economies in the loading, carrying, and delivering of large quantities of material, in bulk, have partly consisted of economies in the time required to load and to unload; but chiefly in economies arising out of increasing the capacity of the conveying unit. In the case of a peat plant of the magnitude indicated, the first and last of these economies are denied, because the location of the peat to be loaded is being constantly changed and because the road that has to be used is on the surface of the bog, which eventually has also to be excavated, and cannot be improved and made into a road that can withstand the traction of great weights. In order to meet these extraordinary conditions, it may be advisable to lay down a moveable industrial tramway, and since the rails of such

a tramway have to be continually moved and relocated they will, of necessity, have to be of light section. There must be correspondingly light cars, of small capacity.

Every peat bog has its own transportation problems, some peculiar to one bog alone, which call for special solution. The cost involved in overcoming such special difficulties, will vary in each particular case. There are not likely to be any difficulties, however, that cannot be overcome at a reasonable cost by the wise use of one or other of the many arrangements available. The difficulty lies more in the selection of the system that will prove to be the most economical under the existing conditions. On certain bogs, it will probably be found most economical to use specially constructed motor tractors, with trailers. These would transport the air-dried peat to permanent storage stations located just outside the limits of the bog. The peat fuel could be conveyed from these stations to the bunkers, over the gas producers, by means of an Ambursen aerial tramway. These stations being permanent, the peat could be handed to the trays of the aerial tramway by means of mechanical loaders. Such a system would have the distinct advantage of permitting the peat fuel required for winter use to be stored in several piles, each at a distance from the power house; instead of in one pile in close proximity thereto.

The Ambursen aerial tramway is economical as to labor, power, and repairs, and is low in first cost. Under favorable conditions, the peat fuel could be delivered into the gas producer bunkers at a price lower than could be done were any system of ground traction used. Moreover, these aerial tramways possess the distinctive advantage that they can be operated during the most severe winter weather, without the extra expense caused by the necessity of having to clear away the snow that may have fallen, or that had been blown upon the tracks.

In some cases, the motor waggons and the trailers could be used—when not otherwise employed—for delivering the peat fuel sold for domestic consumption to nearby customers. A method of operating a bog, suggested in the first place by Mr. A. J. Forward (Editor of the Canadian Peat Journal, and Secretary of the Canadian Peat Society) possesses important merits. In this scheme, the excavator takes a cut through the long centre of the bog, and when the opposite end is reached, the excavator moves into a removable turntable, which transfers it to a track of three rails placed on land or bog that will not be excavated. This track is placed at right-angles to the cut excavated. The excavator is then drawn to a second removable turntable, which is placed at the end of the track of three rails on which the excavator is to operate next. When excavating the next cut, by this method, the excavator is transferred to the track upon which it is to operate, with a minimum loss of time. Indeed, the loss of time may be made so small that it would be possible, during the week following, to make up for the time so lost, thus keeping the production at the desired total. Either one, two, or four excavators can, with proper management, be operated upon one bog when this system is adopted.

It may seem strange that these improved methods of working peat bogs should not have been thought out and put into operation before now; but when it is considered that up to the present time, no peat bog



in Canada has been worked upon a large scale, nor under management that was either experienced or competent; and, with one lone exception, had not the backing of the necessary capital, the negative results obtained, are not to be wondered at.

#### Production of an Excavator.

Great difficulty has been experienced in collecting the data necessary to arrive at a precise estimate of the possible average production of an excavator. It has been claimed that the "Anrep" improved excavator can excavate as much as 4 cubic yards per minute, when operating continuously. Now, a cubic yard of bog peat weighs 1,782 pounds, hence, 4 cubic yards would weigh 3.55 tons. Based upon this estimate, it follows—allowing 8 minutes for the moving of the excavator back upon its track—that the excavator, if kept at work consistently, should excavate 184 tons per hour. But for the presence in the bog of roots, and even of tree trunks, which are found in all bogs, it would be reasonable to conclude that the output of such an excavator would exceed 170 tons per hour. The two storage hoppers now supplied are important factors since they act as regulators. It has been claimed that a section of bog 13 3/4 ft. by 28 ft. by 9 ft., which contains 114 tons could be excavated in half an hour of continuous work, which is equal to 228 tons per hour. As a basis for these calculations, 127 tons per hour—allowing for the 8 minutes loss, as before mentioned—is taken as being quite possible, when the bog does not contain too many roots, etc.

Assuming the reasonableness of the foregoing facts and figures, it is evident that, where advantageous environment exists; where production is increased—due to economic improvements in manufacture—and where there is a nearby market for peat fuel, or gas produced therefrom, that very handsome financial returns may be expected. This is of special importance in the middle provinces of Canada, where the supply of coal is becoming so precarious, and increasingly costly.

#### Utilization of Peat.

In another article will be given the estimated capital cost, working cost, revenue, and profit and loss, of a by-product, recovery, peat-fuel plant and of an electric power plant, designed to develop 10,000 E. H. P., using gas-fired steam boilers, and steam turbine direct connected with an A. C. generator.

The gas producers would burn 65 per cent. peat; that is, peat containing 35 per cent. moisture. The peat used would be of a quality that, when dry, contains 2 per cent. nitrogen.

The nitrogen content of peat is a matter of the utmost economic importance. A bog may be a very paying industrial proposition when the peat contains 2 per cent. nitrogen; while a similar bog containing only 1 per cent. of nitrogen, may not be worthy of attention.

There are many advantages in having the peat plant of much larger capacity than the requirements of the gas producers. In nearly every case it is possible to dispose of the surplus supply of peat fuel in nearby markets at profitable rates; especially when a combination of two businesses is favorable, namely, supply of peat for gas producers, and supply of peat for domestic fuel. This ensures the delivery to the

domestic trade, of just the quality of peat demanded by that trade, a quality which, up to the present time, has seldom been obtainable. Domestic peat fuel can only be satisfactorily made during the height of summer, and even then a proportion of what is made is not first-class. By the combination mentioned, the imperfect peats could be sorted out and be sent for consumption to the gas producers. The gas producers can use peat with a moisture content as high as 40 per cent.

It would not be difficult to so arrange that the peat, while stored in the bunkers over the gas producers should be more or less subjected to the drying influence of heat which would otherwise be wasted. It is quite possible to so arrange that peat containing 50 per cent. moisture could be utilized economically, if it is found necessary to use peat containing so large a percentage of moisture.

(To be Continued).

#### TYEE CO.'S SMELTERY, VANCOUVER ISLAND.

On February 3 it was announced in Victoria, B.C., that Mr. F. A. Serberling, president of the Goodyear Tire and Rubber Co., is at the head of the Eastern American capitalists who have taken over from the Tyee Copper Co., of London, England, its copper smelting works at Ladysmith, Vancouver Island, B.C. The following information has been published:

"Since the announcement was made two months ago of the fact that United States capital was behind the project of enlarging the smeltery and placing it in operation, mystery has surrounded the personnel of the parties behind the transaction. Colonel Stevenson, the veteran Alaskan copper magnate, one of the best known mining men of the North, who arrived in Victoria on February 2, has stated that associated with him in the transaction was Mr. Serberling, who represents other prominent capitalists of the Eastern States.

Colonel Stevenson leaves on February 3 for Ladysmith, where he will look over the smelting works, the plant of which is now being enlarged and placed in position to commence operations. About \$100,000 is being expended in additions and plant, and when ready for operation the capacity will be about 1,000 tons of ore a day, as compared with the former capacity of 600 tons a day.

"Colonel Stevenson states that ores from Alaska copper properties he and his associates are developing will be smelted at the Ladysmith works, and doubtless custom ores will also be treated there."

#### HOLLINGER IN 1917.

General Manager P. A. Robbins says: "We expect to treat in the neighborhood of one million tons per year. The strain of keeping up our production and keeping down costs, while at the same time carrying on a campaign of heavy construction work, has been severe, and it speaks well for the spirit of our organization that good progress can be reported in all work. The central shaft plant is nearly completed, mill and cyanide plant buildings are completed and foundations for machinery are almost completed. If no unusual delays occur in the deliveries of apparatus by manufacturers, it is probable that we shall have a plant ready to treat nearly 3,000 tons of ore daily by the latter part of May."



## MINING OF ANTIMONY ORES IN CANADA

By A. W. G. Wilson

(Continued from February 15th issue.)

### Lake George, New Brunswick.

This discovery of antimony ore was made about the year 1863 in the parish of Prince William, York county, at a point about three miles west of the St. John river and a mile and a half from Lake George. The distance to Fredericton is about 27 miles by road, and to Harvey Station, on the Canadian Pacific railway is about eleven miles. The recently completed St. John Valley railway now runs within about three miles of the property.

According to Bailey "the rocks exposed in the vicinity consist of alternating beds of slate and quartzite, being part of a wide belt of such rocks traversing the central counties, and supposed to be of either Cambrian or Cambro-Silurian age." . . . "The beds are very highly disturbed, and show abundant evidence of metamorphism, connected, no doubt, with the close association of the strata with masses of intrusive granite, which may be seen in situ within a mile of the principal deposits of ore. These latter occur in connection with veins of milky quartz, some of which appear to be coincident with the bedding, though more commonly intersecting this at various angles. The total area over which lodes bearing antimony were found was about 350 acres, the quartz veins varying from a few inches to six feet, in which those of stibnite appeared partly in a network of fine veinlets, and partly in more considerable masses, sometimes attaining a thickness of twelve or fifteen inches. In some parts of the workings very fine specimens of native antimony were found."

The two principal veins are nearly parallel and strike approximately N. 75 deg. W., and dip to the north at an angle of about 45-50 degrees. The ore on these veins is said to have consisted of stibnite with quartz and country rock but without calcite. A third vein, striking nearly at right angles to these and dipping towards the east at an angle of 43 deg. was also discovered in the earlier days. This vein was characterized by the presence of calcite in the gangue, as well as quartz and country rock. A fourth vein appears to have been discovered some years after the first discoveries were made. These veins subsequently received names, in accordance with their location or discoverer. These names in order were Hibbard, Prout, Moody and Brunswick. In addition to the mineral stibnite, which occurs in all of them, native antimony was found in some of the deeper workings, and occasionally coatings of the oxysulphide kermesite or the oxide senarmontite were encountered in the upper workings.

Mr. Charles Robb records that in 1869 three adjoining locations had been worked from time to time during the previous six or seven years. At that time there were three shafts of 90 ft., 200 ft., and 208 ft. in depth respectively. The second shaft, which so far as I can identify it appears to be No. 1 of the Hibbard vein, gave access to about 400 lineal feet of drifting. The third shaft, which I identify as the Lawrence shaft, located on the transverse vein, was the deepest of the three and was in operation at that time.

The first organized company to begin mining appears to have been the Lake George Mining and Smelting Company, which owned the Hibbard property. Their operations began in 1876, but ceased the following year, apparently owing to the failure of one of the principal owners of the company, who was also acting as the selling agent.

About three years later, in 1880, the Hibbard Antimony Company was formed to take over the rights of the former company. This company appears to have controlled nearly 500 acres of ground, 200 acres of which were held in fee simple, and 300 acres under a 999 year lease. The four principal ore veins of the locality were included within this territory. Mining and smelting operations were carried on with partial success for about four years. Near the principal shaft, known as number 2, on the Hibbard vein was erected a concentrating mill employing crushers, rolls, four jigs and one Rittinger table. The smelter included five reverberatory roasting furnaces with condensing chambers for recovering the antimony oxides, and one reverberatory furnace for making regulus. The Hibbard Company ceased operations in 1884.

The Brunswick Antimony Company appears to have been operating the Brunswick vein at about the time the Hibbard Company was working on the Hibbard and Prout veins. I have been unable to ascertain when this company began operations. They owned a smelter at Medford, Massachusetts, where they produced metallic antimony for the purpose of making rabbit metals.

In 1885 the affairs of the Hibbard Company were taken over by the Brunswick Company. The control of this corporation appears to have lain in the hands of a Mr. James and a Captain Adams, both citizens of the United States. The latter is probably the Captain Adams who was associated with the early developments in the Copper Mining Districts of Quebec, who operated the old Hartford mine, now the Eustis, between the years 1866 and 1871, and who built the first copper smelter in Quebec in 1869. For the next two years ores from both the Hibbard and Brunswick veins were shipped to the plant at Medford, but operations ceased in 1886.

During the next year or so the Hibbard vein was worked under lease for a short time, and small shipments of ore were made.

The next incorporated company to operate in the district was the Canadian Antimony Company, Limited, organized in 1907 under the laws of New Brunswick, with a capital stock of \$250,000. This company took over the mines and property formerly owned by the Hibbard Antimony Company, Limited. This company is still the owner of the property, which comprises about 446 acres of freehold, a portion of which is owned by the company, and the balance held under a perpetual lease. At the present time they also control the mining rights over an area of about two square miles.

This company appears to have operated the mines during the years 1907-8-9. The principal mining work was performed on the Prout vein through No. 1 shaft and at No. 6 shaft which lies west of the main workings on the Hibbard vein, and which may be sunk on an extension of this vein, or on a parallel vein.

This company erected a complete oxide plant and a reverberatory furnace for producing metallic antimony.



Trouble seems to have arisen in the metallurgical operations and work ceased in 1909.

About midsummer of the present year the holding company granted a three years' lease, on a royalty basis, to the newly organized New Brunswick Metals Company, Limited. This company immediately took over the property and made preparations to begin active mining and the production of metallic antimony. They found it necessary to make important alterations in the oxide plant and in the reduction furnace and active production will probably not begin until early in the new year. They hope, eventually, to reach a production of three tons of metallic antimony per day. It is proposed to initiate an extensive prospecting campaign during the winter of 1916 with a view to systematic development of the property, which is one of great promise.

The extent of the mining work on the property, at the time the present lease holders took possession, may be judged from the following description of the workings as they existed in 1907. Very little additional development work was done during 1908 and 1909.

The principal veins on the property are the Hibbard and the Prout veins.

The Hibbard vein has been worked most extensively and is stated to have been traced for over one mile in length. Near the east end of the property it and the Prout vein are close together, but as one proceeds westward these veins diverge. Seven shafts have been sunk on this vein.

No. 1 Shaft—Is said to have a depth of 90 feet.

No. 2 Shaft—875 feet west of No. 1, size 6 ft. by 15 ft. and 220 ft. deep. At a depth of 80 ft. a level is driven east 160 ft. About 20 ft. from the shaft a cross-cut has been driven 30 ft.; farther on a winze 30 ft. deep has been sunk, and at 80 ft. from the shaft is an upraise of 20 ft. The vein had a thickness of three feet at this point. The western extension of this drift connects shafts numbers 2, 3 and 4, and is 320 ft. in length. A cross-cut from this level connects with the Prout vein at No. 1 shaft. At a depth of 130 ft. a level is driven east 20 ft. and west 30 ft.

No. 3 Shaft—Depth apparently 80 feet.

No. 4 Shaft—Depth apparently 80 feet, and distance from No. 2 is 320 ft.

No. 5 Shaft—Depth 20 ft., and distance from No. 4 is 280 ft.

No. 6 Shaft—Depth 150 ft., and distance from No. 5 is 1,200 ft. In this shaft levels were driven 160 ft. east and 80 ft. west at a point only 30 ft. from the surface. At 80 ft. from the surface levels were driven 260 ft. and 200 ft. west. At 160 ft. east of the shaft a rise was put in connecting this level with the level above. This shaft has produced a good deal of ore, which is said to have contained a little sulphide of arsenic in addition to sulphide of antimony. This vein also produced some native antimony.

No. 7 or Adams Shaft.—Depth 325 ft., and distance from No. 1 shaft 1,500 ft., size 6 ft. by 15 ft. Three levels are said to have been driven from this shaft, but records of their depth and length are not available.

It is to be noted that it has not been established that Shafts numbers 6 and 7 are located on an extension of the Hibbard vein. They might well be on similar parallel veins.

The Prout vein lies immediately south of the Hibbard vein. It has not been traced for so great a dis-

tance, but it appears to contain the best ore, so far as it has been explored.

No. 1 Shaft has a depth of 260 ft. on an incline of 25 deg. to the north, measures 6 ft. by 15 ft. It is at present (1915) the only one in operation. No. 1 level at a depth of 80 ft. is driven east 120 ft. and west 160 ft. Much of the ore has been stoped out but a small amount still occurs on this level. No. 2 level, at a depth of 115 ft. extended east 50 ft. and west 209 ft. in 1907. At a distance of 100 ft. west of the shaft an upraise was driven connecting with No. 1 level west. No. 3 level at a depth of 200 ft. extended east 100 ft. An upraise was driven from this level to the level above at a point 50 ft. east of the shaft. Work was in progress on both these levels in 1915.

This shaft exposed a well defined vein carrying stibnite ore varying in width from 6 in. to 3 in., the average thickness being probably about 21 ft. of quartz and stibnite. The metallic content would be about 20 per cent. antimony.

No. 2 Shaft has a depth of 50 ft. and is distant from No. 1 shaft 350 ft. No drifting or stoping has been done. The work is said to have exposed a persistent vein of ore varying in thickness from 6 in. to 3 ft., averaging about 20 in. in thickness.

No. 3 Shaft is located 850 ft. west of No. 2. A record of the depth is not available. The vein on the surface has a width of about 20 in.

The principal shaft in use is No. 1 on the Prout vein. This is covered with a building housing the boilers, hoist, and crushing equipment. At present ore blocked out in previous years is being stoped, crushed, hand-sorted and sent to the metallurgical plant.

The metallurgical plant is housed in an adjacent building. The original plant and the metallurgical process were described in 1909 by C. Y. Wang. It has been found necessary to modify the original plant. At the request of the operators a detailed description of the plant and the method of its operation is withheld. It may be stated, however, that the system used is a modified Herreshmidt plant in which oxides of antimony are produced by roasting the ores in a vertical type of blast furnace with coke. The oxides are collected in special cooling and condensing chambers and are subjected to a special leaching treatment to remove the arsenical oxides. The leached oxides are then dried, the surplus heat from the flues being utilized for this purpose, mixed with reducing agents, and treated in the reduction furnace.

Other veins. In addition to the two principal veins, the Hibbard and the Prout, the earlier reports mention two other veins—the Brunswick and the Moody.

The Brunswick vein was operated by the original Brunswick Antimony company in the early eighties. Its strike is said to be parallel to that of the Hibbard vein. It lies about 250 ft. north of it and dips to the north. I have been unable to find any record of the amount of work done. It lies within the boundaries of the property leased by the New Brunswick Metals Company.

The Moody vein is apparently a cross vein, striking nearly at right angles to the main vein and dipping towards the east. There are said to be two shafts on this vein. So far as I have been able to identify it, this vein is the one upon which work was in progress in 1869 at the time of Mr. Charles Robb's visit to the locality. He mentions a shaft 208 ft. in depth, which



is probably the Lawrence shaft. The other shaft has a depth of about 65 feet.

The mining rights over three square miles of territory, adjacent to the property of the Canadian Antimony Company, Limited, and including the property in which the old Lawrence shaft is located, are controlled by Mr. A. R. Slipp, K.C., of Fredericton, N.B., and associates.

#### South Ham, Quebec.

Antimony ores were mined on lot 56, range I, township of South Ham, Quebec, many years ago. The present writer visited the locality in the summer of 1909. His report on this visit was published in the Summary Report of the Mines Branch for 1909. To make this account of Antimony mines in Canada complete the report is reproduced here:

"The old workings were not accessible, because the adit was blocked by clay and water, and the shafts were partly filled with snow and ice. As far as could be ascertained from a surface examination, the ore consists of metallic antimony, together with stibnite, and smaller amounts of other antimony-bearing minerals. The associated rock is chloritic schist, striking nearly northeast, in which numerous lenses of quartz, usually almost black in color, are found. In width these vary from narrow veins to lenses about 2 feet across. In the vicinity of the mine the quartz veins examined were all characterized by swells and rolls—narrowing to one-quarter of an inch, or even disappearing, or widening to 2 or 3 inches.

"In the vicinity of the old mine-workings the rocks are pretty well shattered by joints, and there appears to have been a slight jostling of the joint blocks; the cavities thus formed have been filled with quartz. Such veins are very irregular in both dip and strike; presumably, some of the spaces which they now occupy were open spaces when the vein matter was introduced, because some of the quartz veins show comb structures. Originally, also, there appear to have been bands of sulphides (iron and possibly copper) between the quartz bands. In a vein 1 inch wide, six bands of quartz and five bands of red oxide of iron were noted; the latter about 25 per cent. of the whole. Occasional vugs lined with quartz crystals, and containing crystals of antimony minerals, stibnite ( $\text{Sb}_2\text{S}_3$ ), kermesite ( $2\text{Sb}_2\text{S}_3, \text{Sb}_2\text{O}_3$ ), cerantite ( $\text{Sb}_2\text{O}_4$ ), valentinite ( $\text{Sb}_2\text{O}_3$ ), and senarmontite ( $\text{Sb}^2\text{O}_3$ ) still exists. Stibnite was noted both in plate-like crystals, and in minute acicular crystals. Kermesite in small tufts of acicular crystals, and more rarely, a yellow tinted oxide, probably cerantite, occur. In a few instances metallic particles were found in the quartz of the veins. In the rock adjacent to the veins more abundant metallics were noted, and on breaking the rock a large proportion of the metallics are seen to be distributed as thin plates along fracture planes—in some places producing a bright metallic lustre over a considerable area. Metallics in thicker particles also occur scattered through the rock. The ore in the rock seems to be most abundant near the veins. In many places, through the zone supposed to be mineral bearing, no visible particles of ore could be found. In some places impregnated rock was found adjacent to a fracture in which no quartz occurs.

"The strike of the structural planes of the schists lies between N. 40 deg. E. and 50 deg. E. magnetic, or, towards the ridge which lies north of the mine, and the front of which runs nearly east and west. The pres-

ence of a waste cover makes it impossible to study the area for any distance along the strike. The prospecting work has all been along the face of the hill, or nearly at right angles to the strike. Between the most easterly shaft and the most westerly one, the distance is nearly 300 yards. Prospecting pits are to be found for some distance west of the main shaft, and much costeaning has been done.

North of the shafts the hill referred to above forms a dome-like ridge about a quarter of a mile in length. It is composed of basic plutonic rock, now serpentine on the side next the schists, but consisting of a diabase on the north side. About 850 feet southeast of the east of this ridge is another similar but smaller dome. Nearly half a mile south of the shafts—on the opposite side of a valley—lies a large area of serpentine rocks, which gradually pass into diabase farther south. The two small dome-like ridges in the immediate vicinity of the mine carry included fragments of schists in the upper surface, and they were probably forced into the schists as lacolithic masses from below. This circumstance makes it extremely probable that the band of schists has no great depth.

"The mineralized area or zone lies close to the contact between the schists and the intruded serpentines. It is thus probable that other mineralized areas may occur in the same district along the line of contact. While the shape of the intruded masses makes it possible that the orebearing band may be of no great depth, there are no data at present obtainable from which it would be possible to determine what that depth is. On the other hand, it is also possible that the mineralized zone may follow the supposed curved surface of contact between the schists and serpentine and that a very considerable area beneath the schists may carry antimony minerals.

"In 1881 there were two shafts on the property, 60 feet and 100 feet in depth, respectively, and 250 feet of drifting. Assays of the ores as they occurred in these shafts and drifts are said to have shown from 5 to 7 per cent. of antimony. A small experimental plant was in operation in that year. The ore was crushed by stamps and then washed upon a broad travelling belt, the lighter particles being washed off, while the heavier were deposited at the end of the belt. This plan does not appear to have been very efficient and the losses in the tailings were high.

A number of small trial shipments were made from the property in 1881. The returns from these shipments show an antimony content of about 7 per cent. Experimental work on a Krom machine produced concentrates assaying from 30 per cent. to 49 per cent. antimony, in different experiments. In one case, what are called "extra concentrates" were obtained—assaying 53.9 per cent. antimony. Concentrates on a Hastings machine assayed 37.13 per cent. The ore was found to contain about 4 ounces of silver to the ton of 2,000 pounds. No gold has been reported.

"In 1886 the property was purchased by Dr. James Reed. Under his control an adit was driven into the side of a hill to cut the deeper shaft near the bottom. This adit is about 304 feet in length. A small amount of drifting was done in later years, but no information is now available as to the results obtained.

"The thin plate-like character of the particles of metallic antimony, as seen on the fracture planes of the rock near the surface, undoubtedly will make concentration difficult. While the concentration ex-



periments made on the ore from the drifts and shafts seem to have yielded a product that is commercially valuable, no data whatever are available as to the costs. Nothing can be learned about the quantity of rock handled in obtaining this ore, and the weight of the ore mined is not known. Further information is needed with respect to the underground conditions; the surface showings are not of commercial importance."

#### Bridge River District, British Columbia.

No information with respect to antimony occurrences in this locality is immediately available. I understand that a small amount of stibnite was shipped during the past summer.

#### Wheaton River District, Yukon.

This locality is situated about 30 miles from Robinson station on the White Pass and Yukon railway. The district was studied by Dr. D. D. Cairnes, of the Geological Survey, in the summer of 1909, and the results of his work were published in 1912. During the past field season (1915) Dr. Cairnes revisited the locality and a report of his more detailed study of this district will presumably appear in the Summary Report of the Geological Survey for 1915.

A good wagon road connects Robinson with the district in which these ores occur. Robinson is only 78 miles from Skagway by rail. It is therefore to be expected that if the ores of this district prove to be as valuable as is anticipated, they may be an important source of antimony in the future. At present there is no regular output, and only small trial shipments have been made.

In this locality a remarkable series of antimonial silver veins have been discovered, outcropping on both sides of the Wheaton river on Chieftain Hill and Carbon Hill.

#### According to Dr. Cairnes,—

"These antimony-silver ores occur distributed throughout a westerly-trending belt about 5 miles long by 1-5 miles wide, which includes all the southern portion of Carbon hill, and extends to the west across Wheaton river, and embraces the central portion of the eastern face of Chieftain hill. The greater number of the veins, however, have been discovered on the western face of Carbon hill, on an area about one mile in diameter. These ores occur in the Jurassic Coast Range granitic rocks, and in the Chieftain Hill andesites and volcanic breccias. The veins have, with one exception, a general westerly trend and are either perpendicular in attitude or dip to the north-east.

"Two of the veins are traceable for over 2,000 feet on the surface, but other outcrops are generally covered with superficial materials, so that 200 feet is the farthest that any of them have been followed, but a number probably extend much greater distances.

"The veins vary in thickness from 2 or 3 inches to 6 feet, but 1 to 3 feet is generally about the average of the more valuable. The fissures, in all the cases so far discovered, appear to be simple in form and without any foot or hanging-wall stringers or branching fissures.

"The ores consist chiefly of quartz, calcite, barite, stibnite, sphalerite, jamesonite, galena, and grey copper. Stibnite constitutes the greater part of the vein-fillings in parts of some of the veins and in such cases is generally associated with minor amounts of sphalerite and jamesonite. Wherever any gangue is present,

it is generally chiefly quartz, barite and calcite occurring only in subordinate amounts. The veins that are richest in silver consist of a quartz gangue impregnated with more or less galena and grey copper, and very few antimony minerals. In fact, the ores high in silver are generally low in antimony, and vice versa. But there are places where both antimony and silver occur together in considerable amounts.

"Assays running over 500 ounces of silver to the ton have been obtained, but they are very exceptional. Samples of the better class of ores containing galena and grey copper often carry from 100 to 200 ounces. The better grades of the stibnite ores contain 50 per cent. to 65 per cent. of antimony. The ores rarely contain more than a few cents per ton in gold. It is not known what the ores will average over any considerable portion of their outcrops, nor what they will assay more than 10 feet below the surface.

"The zone of vein-oxidation is prevailingly shallow, and unaltered sulphides generally occur within a few inches or 4 or 5 feet of the surface. Only a slight amount of leaching appears to have taken place in these ores."

Further and more detailed descriptions of the various veins in this locality will be found in Dr. Cairnes' report.

#### WHITEHORSE DISTRICT, YUKON.

Newspapers published in Vancouver and Victoria, British Columbia, printed last month an account of an interview with Mr. J. P. Whitney concerning mining conditions, with especial reference to Whitehorse copper camp, which is situated in the southern part of Yukon Territory. Mr. Whitney said, in part:

There are in Whitehorse copper camp five properties that are making an excellent showing, and with copper at prices from 27 1-2 to 30 cents a pound they are paying enterprises. The Grafton mine is shipping from 600 to 1,000 tons of ore a month; the old Pueblo mine, now known as the Yukon, has an output of about 600 tons monthly; the Copper King has an average of 300 tons, the War Eagle 450 tons, and the Anaconda 100 tons a month. All these mines were being worked at full capacity last summer, and arrangements were made for starting another one, known as the Empress of India. In addition, there are others that will be developed in due course.

Referring generally to the mining industry in the Canadian West, the trouble is to procure capital in Canada. There is only a comparatively small amount of Canadian capital invested in the mines in British Columbia or Yukon Territory; most has come from the United States. In Canada, people seem to be afraid of any mining proposition, and the result is that promoters have to go south to obtain money necessary to do development work. The ore from the mines he is interested in is being shipped to the smelting works at Tacoma, Washington, instead of to the Granby Consolidated Co.'s smelter at Anyox, B.C., as formerly, due to an insufficiency of power at the latter works, to allow of all custom ore offering being treated there.

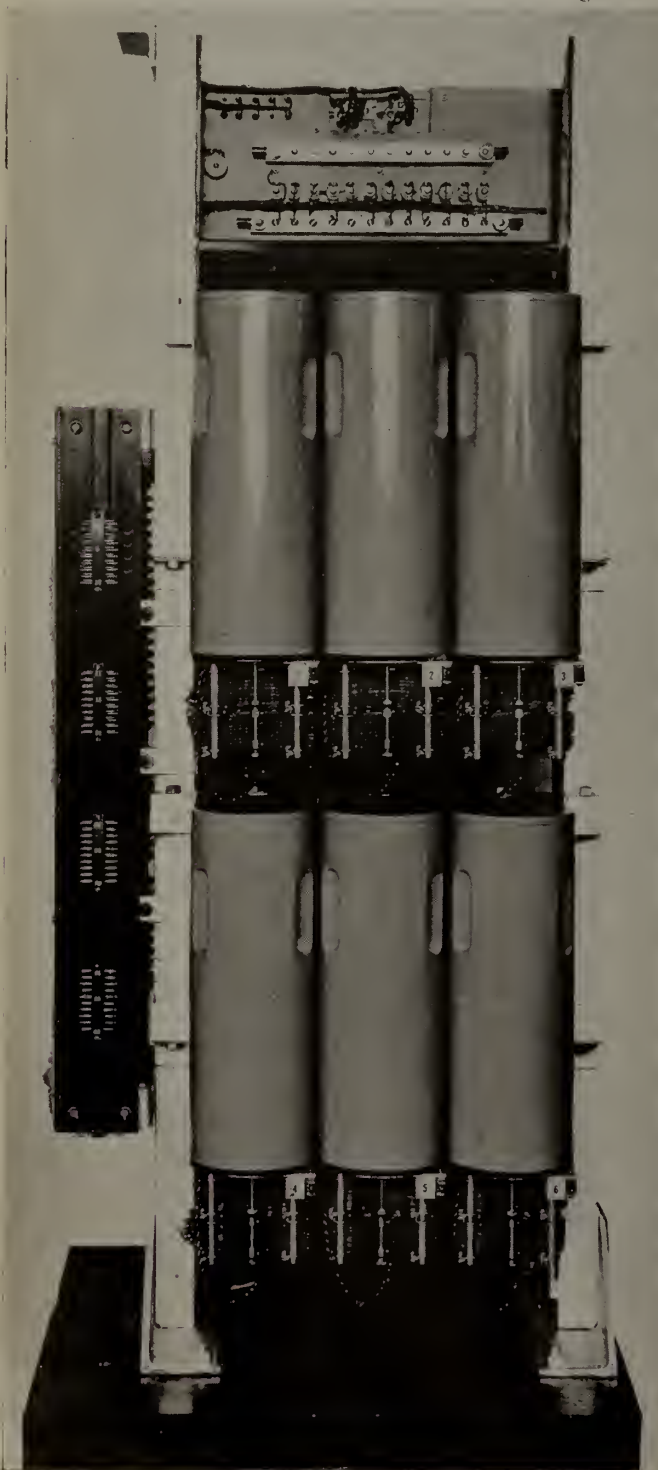
The twenty-fourth general meeting of members of the Western Branch of the Canadian Mining Institute will be held in Vancouver, British Columbia, on March 15. The Copper Mining Industry of the Coast District and Mine-Safety matters will be two of the subjects to have the attention of the meeting.



### AUTOMATIC TELEPHONY.

For the past fifteen years the demand for better telephone service has been insistent. No matter what progress was made in any year, the needs of users and of possible buyers has been far beyond the capabilities of any equipment that has been offered on the Canadian market.

This year The Automatic Telephone is being introduced in Eastern Canada and is already proving its merit. In the West, the cities of Calgary, Edmonton, Lethbridge, Medicine Hat, Prince Albert, Regina and Saskatoon have for years been fully equipped with Automatic Telephones, and every one who has used them there is enthusiastic over the service. They say it is incomparably better than anything in the East, in either public or private plants.



No matter what local conditions are, they can be met by The Automatic Telephone, and the service is faster and surer than with any other type. The Automatic Telephone does not make mistakes, call wrong numbers, give false busy signals or disconnect during conversation. The Automatic Telephone is a straight two wire, full metallic circuit, this doing away with all possibility of disturbance on the lines caused by induction from power or lighting circuits.

The small dial is really a private operator for each telephone in the plant—an operator not paid but made to give perfect service. The switchboard is wonderfully simple and complete, and is fully automatic in the true sense of the word. Over 1,000,000 of these telephones are in service to-day in practically every country in the world; good evidence of the quality of service and satisfaction they are giving. The cut shown on this page illustrates the switching equipment of a 25-line board. A system can be started with twenty-five lines or less and can be added to just like a sectional bookcase.

Signal Systems, Limited, are Canadian Sales Agents of The Automatic Electric Co.

### CANADA'S NEW MOLYBDENITE MINE.

During 1916 there was developed in Quebec near the village of Quyon, Pontiac county, an excellent deposit of molybdenite. The property, known as the Wood mine, is now Canada's chief source of molybdenite. Concerning this property Mr. J. A. Dresser writes in the March bulletin of the Canadian Mining Institute:

"Hand sorting is done in the pit and on the surface but the total amount of waste rock is small, apparently little more than 10 per cent. After trial shipments had been made to the laboratory of the Wood Ore Testing Company at Denver, the ore was principally sent to the concentrating plant of the Mines Branch of the Department of Mines at Ottawa. In shipment the ore is hauled by teams from the mine to Quyon station on the Waltham branch of the Canadian Pacific Railway, a distance of 3 miles over an average country highway. The hauling is done by contract, generally by farmers from the neighborhood. The ore is shipped without crushing and may be in blocks up to any size that can be conveniently handled by two men.

"A concentrating mill capable of treating 60 tons of ore in 24 hours has recently been completed at the mine and second concentrator of 150 tons capacity is also being built in the city of Hull, 35 miles distant, by the owners of the mine. The essential equipment of each mill consists of crushers, rotary dryers and ball mills together with a Wood flotation plant designed and patented by Mr. Henry E. Wood of Denver, one of the owners. Commodious quarters for the men, well lighted and furnished are a noteworthy feature of equipment of the mine. Exclusive of the teamsters who work by contract about 130 men are at present employed in mining construction."

### PORT ARTHUR COPPER COMPANY.

During the past year a number of shipments of copper ore have been made from Mine Centre, Ontario. The Tip Top mine is the chief producer. A neighboring property is being developed by Mr. F. M. Connell, of Toronto, and associates. A company, known as the Port Arthur Copper Co., has been formed to carry on the work begun on this property.



## PERSONAL AND GENERAL

Mr. Samuel W. Cohen, general manager Crown Reserve Mining Co., Ltd., Porcupine-Crown Mines Limited, consulting engineer Dominion Reduction Co. Ltd., is now permanently located in the Dominion Express Building, Montreal.

Mussens Limited of Montreal have removed from 318 St. James St., and are now occupying their new offices on the second floor of the McGill Building, 211 McGill St., Montreal.

Lieut. J. C. Murray is at St. John's, Quebec.

Mr. Noble W. Pirrie, formerly of Vancouver, B.C., where for several years he had a wide business connection with mining men as an assayer, is now Director of Explosives for the Imperial Munitions Board at Ottawa.

Mr. Harold W. Aldrich, of the Anaconda Copper Mining Co's Washoe smelting works at Anaconda, Montana, about the middle of February visited the copper smelting works at Ladysmith, Vancouver Island, B.C., recently sold by the Tyee Copper Co., to United States capitalists.

On February 16 the "Daily News" of Nelson, B.C., published the news that Major Angus Ward Davis and Captain Allen Bruce Ritchie had been honored for bravery on the field in the European War. The Distinguished Service Order had been conferred on Major Davis, and the Military Cross had been awarded to Captain Ritchie. Both enlisted as privates and left British Columbia with the first contingent of Canadian Engineers, and were afterward given officers' commissions for distinguished work. Both were on the Consolidated Mining and Smelting Co's staff, Major Davis as a field mining engineer and Captain Ritchie as a mine superintendent. Another of the Consolidated Co's staff, Lieutenant Graham Cruickshank, who was in charge of the company's experimental concentration plant at Rossland, has also received the Military Cross for gallant service in the field and has been decorated by the King. Lieut.-Col. John E. Leckie, D.S.O., mining engineer, who went to the War from Vancouver, B.C., has been gazetted in London a Companion of St. Michael and St. George.

Mr. M. S. Davys, of Kaslo, B.C., managing director of the Silverton Mines, Ltd., operating the Hewitt and Lorna Doone mines and concentrating mill near Silverton, Sloean lake, and latterly at the head of the enterprise having for its object the establishment at Kaslo, Kootenay lake, of a silver-lead ore concentrating and magnetic separating industry, the latter for the making of marketable zinc concentrate, left Nelson, B.C., for Pasadena, California to recuperate after a severe illness with pneumonia.

Mr. E. V. Buckley, manager for the Queen Mines, Inc., has returned to Sheep creek, in Nelson division of British Columbia, to arrange for an early resumption of gold mining and milling at the Queen mine after a suspension of work of nearly six months' duration.

Mr. Alex. Smith, of Kaslo, B.C., who for years had charge of the development of the Surprise silver-lead-zinc mine, situated above Cody, in Sloean district of British Columbia, left that province on February 15 for a visit to Toronto, Ontario.

Mr. Thos. J. Lloyd, for several years prior to the closing of the Van-Roi mine, near Silverton, Sloean, B. C., in charge of underground operations in that mine, is again directing development work there, the mine having been taken over by Mr. Clarence Cun-

ningham and associates, who will energetically operate both mine and concentrating mill.

Mr. E. G. Houghton, of the Jewel gold mine, near Greenwood, Boundary district of British Columbia, is now in military training camp at St. Johns, Quebec.

Mr. Albert I. Goodell, for several years manager of the smelting works at Boundary Falls, B.C., and afterward superintendent of the Northport Smelting and Refining Co's reduction works at Northport, Washington, is now in charge of a small smelter in Montana.

Mr. Thomas W. French, of Nelson, B. C., manager for the French Complex Ore Reduction Co., when in Victoria about the middle of last month stated that the company's electrolytic zinc reduction plant, at Nelson, was then nearly ready for operation, only awaiting the arrival from the East of a little more machinery to allow of a commencement being made to treat zinc ores.

Mr. C. L. Copp, formerly superintendent of the Coronation and Pioneer gold mines, in the Bridge River region of Lillooet district, British Columbia, last month was in the Canadian training depot at Shorncliffe, Kent, England.

Mr. Oscar Lachmund, of Greenwood, B. C., general manager for the British Columbia Copper Co., was in Spokane, Washington, last month, attending the Northwest Mining Convention.

Mr. A. L. McCallum is superintendent of the sulphuric acid plant designed by him and erected under his supervision at the Consolidated Mining and Smelting Co's big smelting and refining works at Trail, B. C.

Capt. John L. Retallack, formerly of Kalso, B. C., who in 1915 left Victoria for England on active service as quartermaster-sergeant of the 48th Battalion, has severed his connection with that regiment and now holds an important post in the 239th Railway Construction Battalion, which left Canada for Europe several months ago. For many years he was actively associated with mining in Sloean and Ainsworth divisions of British Columbia.

Mr. Walter Newton, assayer, of Sandon, B. C., fell down a mine shaft last month and received injuries that have incapacitated him for duty for a while.

### MINING SOCIETY OF NOVA SCOTIA.

The Annual Meeting of the Mining Society of Nova Scotia will be held in Sydney, April 19th, 1917. The forenoon will be taken up by a visit through the works of the Dominion Steel Corporation. At two o'clock the same afternoon the meeting will convene for general business and the reading of papers. Owing to the war, the usual banquet will not be held.

The following officers have been elected by acclamation: President, Col. D. H. McDougall; vice-presidents, Col. Thomas Cantley and Alfred J. Tonge; Secretary-Treasurer, E. C. Hanrahan; Associate Secretary-Treasurer, E. B. Saunders.

### MAGNESITE.

Active development and exploitation of the magnesite occurrences of Argenteuil county, Quebec, is being carried on. The shipments in 1916 reached 53,976 tons, valued at \$525,966, as compared with 16,285 tons valued at \$137,353 in 1915.

One of the mines, the Scottish Canadian Magnesite Co., is now connected by a railway spur of 12 miles with the C. P. R.



## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA.

Recent editorial comment in the Kaslo "Kootenaian" on the question of possible further taxation of the mining industry in British Columbia follows:

"The Provincial Government is faced with the necessity of raising more money for carrying on the affairs of state. . . . Alarm is felt in some quarters that there may be some additional burdens placed on the mining industry. If the Government is wise it will leave the mining industry alone as far as increased taxation is concerned, for the present at least. Any promise of increase in taxation is bound to do the mining industry of the province great injury in view of the fact that capital is so hard to attract even under the most favorable conditions. With high metal prices the chance to get the necessary capital invested in our various mining enterprises now appears very good, but if capital once gets the idea into its head that it is going to be mulcted of a big share of the profits of what is known to be a very speculative enterprise, it is not going to speculate at all, at least so far as British Columbia is concerned. At a time like the present, every pound of copper, zinc, silver, and lead that is produced is making it just that much easier for the allies to win the war, and every encouragement should be given to the capital from outside financial centres to come in and go after the metals. The 2-p.c. mineral tax is bad enough, but it is well to leave it as it is or else fix it so that it more evenly falls on the mines or mining companies which have proved up and which are yielding their owners big profits, far in excess of the ordinary. On the other hand things should be made just as easy as possible for the investor who is just breaking into the game. The mining goose may be quite prosperous, but it would be wise not to kill it while it is laying the golden eggs."

In this connection, the Nelson "Daily News" observes editorially: "As the 'Kootenaian' points out, an increase of taxation of the industry by the Province, as part of the plan of the Brewster Government to raise more revenue, would inevitably have the result of frightening capital away. And capital for many years to come will be the greatest need of the mining industry. Adequate development is impossible without it. At this time mining in British Columbia is of more than Provincial or Dominion importance. It is an industry of Imperial importance. In fact, mining production in this Province cannot fall off without hurting the cause of the Allies, who need every pound of zinc, copper, and lead that they can get. The Hon. the Minister of Mines should let it be widely known at the earliest possible moment that the industry is not to be set back by additional taxation."

Shortage of water for power purposes, where concentrating-mill and compressor plants have to depend on a good water supply in order that motive power for their machinery may be obtained, has interfered with mining and milling operations in parts of Kootenay district. In the Slocan, particularly, has this difficulty been experienced during the first two months of the year. On the other hand, the snowfall has been heavy, generally speaking, so that when the cold weather shall have given place to a mild or warm temperature, there will be abundant water for all purposes.

The note of alarm sounded by Kootenay newspapers, referred to in previous correspondence, has been taken cognizance of in Spokane, Washington, in which city

there are large numbers of men interested in mining companies operating in the Kootenay district of British Columbia. The matter was twice mentioned at sessions of mining men attending the Northwest Mining Convention. One mining operator telegraphed the Minister of Mines, Victoria, as follows: "Recent Kalso and Nelson newspapers suggested Government purposes increasing taxation on mines or ores. Mining men attending Northwest Mining Convention, now in session here, consider this prejudicial to investment in British Columbia properties. Respectfully request your authority by wire to place before convention your denial of suggested change." The reply received from the Minister of Mines read thus: "In answer to your wire, no changes in taxation on mines or ores have yet been considered. Any reports to the contrary are premature and unwarranted."

Professor Arthur Lakes, a veteran geologist and contributor to mining publications, long active in Colorado but of late years resident at Nelson, B.C., in the course of a short address made at one of the sessions of the Mining Congress in Spokane, said: "British Columbia is but in the infancy of its mineral development, despite vast strides at many large properties. In Colorado, where timber growth is not heavy by comparison, they say there is no use in sending out prospectors, the situation of about every great ore-deposit having been discovered. But the condition in British Columbia is different. The country there is so covered with timber that ore deposits are not to be seen readily. There is lots of room in British Columbia to find more ore-deposits than are now known of."

### EAST KOOTENAY.

Several cars of ore have been shipped to Trail from the Burton mine, which is the only property in the neighborhood of Elko, on the C. P. R.'s Crowsnest railway, in Fort Steele mining division, that has shipped ore in bulk. In his summary report for 1913 Mr. S. J. Schofield, of the Geological Survey of Canada, gave the following information relative to this property: "The Burton group of claims is situated on the western slope of the Rocky Mountain system about four miles northwest of Elko. The country rocks in the neighborhood consist of the upper members of the 'Galton series' of Pre-Cambrian age and the lower palaeozoic formation, all of which strike N. 40 deg. W. with a dip of 45 deg. to the East. The vein, which is two to four feet wide, occurs in a fissure in the Roosville siliceous metargillites. There has been a vertical displacement along the fissure of four feet. The vein, which strikes N. 50 deg. E., and dips 85 deg. to the North, consists of pyrite and chalcopyrite in a gangue of quartz. The value sought after is in copper and gold. A tunnel about 400 ft. long has been driven along the strike of the vein to the contact of the Roosville and Burton formations. The possibility of this vein extending farther into the hill will depend upon the ability of the Burton shales to carry a well-defined fissure." No official description of later date is available.

A press despatch states that on the night of February 27 fire destroyed the entire concentrating plant and mill building at the St. Eugene mine, Moyie, owned and operated by the Consolidated Mining and Smelting Co. The old mill and equipment was stated to have been of a value probably of \$300,000; the plant was being remodeled for experimental work, and a



short time ago it was reported that ore was to be sent there from the company's Sullivan lead-zinc mine, also situated in Fort Steele mining division. The original mill building was of wood throughout; it was 250 ft. by 125 ft., and its height from the lowest floor to above the part where an aerial tramway delivered ore from the St. Eugene mine was about 100 ft. Solid masonry walls supported the several terraces on which the machinery stood on concrete foundations. The earlier equipment included Cornish rolls and a Hunt-ington mill for ore-crushing, 14 Hartz jigs, 10 Wilfley tables and 20 Frue vanners, but additions of improved concentrating appliances were made in later years. Milling was commenced in April, 1900, and the first year's operations showed a daily capacity of 400 to 500 tons. Up to June 30, 1912, the total output of the mine had been 1,015,280 tons of ore and the concentrated product shipped, nearly all to Trail, had totalled 190,121 tons. Since then the mill had been inoperative, and the small output of the ore in quite recent years had been shipped as crude ore.

**Ainsworth.**—More ore was shipped to Trail from Ainsworth mining division during the week ended February 21 than in any other week of this year. The out put was as follows: Bell, 71 tons of zinc ore; Bluebell, 63 tons of lead concentrate; Highland, 177 tons of silver-lead ore, and Utica, 49 tons of silver-lead ore; total, 360 tons. This quantity does not represent the total output of the division, for the Florence Mining Co. is now operating its new concentrating mill, the product of which has not yet been shipped to the smelting works.

**Slocan.**—It is reported that the amount of ore found in the Van-Roi mine, in Silverton camp, since operations were commenced in it by Mr. Clarence Cunningham and associates, is very satisfactory and encouraging. Some 30 men are employed.

Snowslides have blocked the Kaslo and Slocan railway between Zineton and Three Forks, thereby cutting off the supply of ore from the Lucky Jim mine for the concentrator at Rosebery. The railway line has been cleared between Kaslo and Zineton, so ore has been shipped to the concentrating plant at Kaslo.

**Nelson.**—The Rio Tinto recently made its first shipment of copper ore to Trail from Beasley Siding, near to the British Columbia Copper Co.'s Queen Victoria mine.

The Eureka copper mine, at the head of Eagle creek, continues to ship ore, the total of receipts at Trail from this mine for 1917, to February 21, having been 503 tons.

Developments in the lower level of the Hardserabble mine of the Granite-Poorman group, are stated to be increasingly satisfactory, the size of the ore-shoot and the gold content of the ore both being well up to expectations.

During December and January 37 carloads of zinc ore were shipped from the Hudson Bay mine, in the Salmo region of Nelson Mining division. This production was made by W. G. Harris & Co., lessees.

Receipts at Trail of lead ore from the Emerald mine since January 1st have exceeded 1,000 tons. Work at the Molly molybdenite mine, on Lost Creek, was discontinued last month. Both these mines are situated southeast of Salmo.

**Rossland.**—Shipment of ore to Trail is gradually getting back toward former proportions, the available supply of coke for the copper blast-furnaces at the

smelting works being now larger than for several previous months. Last October the average of daily receipts at Trail from Rossland mines was 625 tons; in November it was 594 tons; for December it was very low, only 203 tons a day, shipment from the Le Roi and Centre Star mines having been suspended during two weeks, and the output for the remainder of the month much curtailed; for January the average was 404 tons, and for three weeks ended February 21, 444 tons. More than half the February production was from the Le Roi mine, with a total of 5,721 tons for the three expired weeks, while that of the Centre Star group was 2,854 tons and of the Josie group 739 tons.

The Le Roi 2, Ltd., London, has made public the Josie mine report for December, received late in January from its managers at Rossland, as follows: Ore shipped, 703 tons. Receipts from the smelter were \$43,758 in payment for 1,448 tons of ore; sundry receipts were \$191; total receipts, \$43,949. Expenditures during the same period were estimated at \$6,650 for ore production and \$9,500 for development (including diamond-drilling); total, \$16,150.

**Trail.**—Ore receipts at the Consolidated Mining and Smelting Co.'s smelting works during three weeks ended February 21, totalled 30,471 tons, in the following proportions: From East Kootenay, 9,460 tons; Ainsworth, 670 tons; Slocan, 936 tons; Nelson, 674 tons; Rossland, 9,314 tons; Arrow Lake, 18 tons; Lardeau, 26 tons; Revelstoke, 40 tons; Boundary, 2,585 tons; Nicola, 38 tons; Kamloops, 392 tons; Vancouver Island, 25 tons; Omineca, 99 tons; Alberta, 40 tons; Ontario, 439 tons; State of Idaho, 1,259 tons, and State of Washington, 4,456 tons. The daily average of receipts for this period was 1,451 tons as compared with 1,180 tons for the month of January, 948 tons for December, and 1,358 tons for November.

**Other Divisions.**—Small quantities of ore continue to be shipped occasionally from the Millie Mae, in Arrow Lake division; the Beatrice, in Lardeau in Revelstoke division and the Lanark at Illecillewaet. In both Lardeau and Trout Lake division prospecting and development is being continued, but the lack of transportation facilities is an obstacle in the way of shipment of ore.

#### SIMILKAMEEN.

When in Spokane last month, Mr. Oscar Lachmund, general manager for the British Columbia Copper Co., said, as reported in a local newspaper: "We have proved the occurrence of at least 5,000,000 tons of ore in our Copper Mountain property ten miles south of Princeton, Similkameen, and expect to greatly increase the quantity developed in the next two months. Exploration of the ground by diamond drill, engaged in several years ago, has been followed by a comprehensive system of tunneling, lateral operations, and raises, by which the quantity just mentioned has been developed. The tunnel has a maximum depth of 225 ft. in an advance of 2,000 ft. This makes possible the ready removal of the ore above the tunnel level by 'glory-hole' methods, and the remainder by various stoping methods. The ore lies in parallel bodies adjoining the dikes that traverse the country in northerly and southerly directions. We figure on an output of 3,000 tons daily, and an increase as conditions shall warrant. The average content of the ore is 1.75 per cent. copper, although bunches of ore in some sections contain 4 to 5 per cent. The recoverable value in gold and silver is



about 20 cents to the ton. A 50-ton concentrating plant is being installed, chiefly for experimental purposes in dressing the ore."

#### YALE.

In Nicola mining division there is more activity in developing mineral claims than for a long time past. The chief shipper so far has been the Aberdeen, with a total of about 1,400 tons of copper ore in 1916 and 167 tons additional received at the smeltery at Trail up to the first week in February of this year.

Satisfactory results are reported from the Highland Valley Mining and Development Co's operations at its mine and mill in Ashcroft mining division. A good percentage of recovery of copper concentrate from the tables is supplemented by further saving of the metals by flotation concentration of the tailing.

Receipts at Trail from the Iron Mask mine in Kamloops mining division, between December 31 and February 21 have totalled 1,084 tons. An official report states that the mine is six miles south from Kamloops, and that it was operated continuously in 1916 with 50 to 60 men employed, and that approximately 8,000 tons of ore was shipped. The ore contains a good average value in copper; much of it is concentrated before shipment to the smelting works.

#### COAST.

Preparations are being made for working on a larger scale the Ikeda mine, on the south east coast of Moresby island, one of the Queen Charlotte group. Last year's output of ore was reported to have been about 1,060 tons containing 7 per cent. copper, which ore was smelted at The Granby Consolidated Co's smeltery at Anyox, Observatory inlet. W. G. Norrie, superintendent of the Silver Standard mine, near Hazelton, Omineca mining division, is stated to have mapped out the work to be done this year at the Ikeda, and is to visit the mine periodically to direct new development as progress shall be made.

Shipment of ore from the Dockrill & Jefferson mining property in Howson basin in Telkwa district, Omineca division, to the smeltery at Anyox has been commenced. The ore has to be hauled 37 miles over a sleigh-road to the Grand Trunk Pacific railway by which it is conveyed to Prince Rupert and is shipped thence to Granby bay by steamer. In an official publication it is stated that there is on this property a vein of high-grade copper ore, mainly chalcocite and bornite and it was expected that more than 300 tons would be hauled to the railway during the winter.

#### BOUNDARY.

Mr. D. C. Corbin and associates, of Spokane, Washington, who own mineral claims in Copper Camp, have let a contract for driving 100 ft. of adit on the Copper Queen claim. Years ago a lot of high-grade ore was shipped from the King Solomon, one of the group, but it was from a secondary enrichment deposit of ore that was of much better grade than the sulphide ore occurring at greater depth.

Shipments of ore from the Union mine, in Franklin Camp, 40 to 50 miles up the north fork of Kettle River from Grand Forks, are being made at the rate of about 40 tons a week to the Granby Consolidated Co.'s smeltery at Grand Forks. A published report gave the total quantity shipped in 1916 from this mine to the Granby Smelting Works as having been 261 tons; for 1915 the output was 517 tons. In the "Annual Report of the

Minister of Mines, 1915," it is stated that: "A good idea of the average value of ore from the Union mine is conveyed in a report by the mine superintendent, in which it was shown that the average gold and silver contents of more than 200 tons of ore shipped to Grand Forks was 0.85 oz. gold and 45 oz. silver a ton. The cost of hauling 25 miles to the railway was \$13.50 a ton, freight by rail to smeltery was \$1.50, and charge for smelting, \$6.75; total freight and treatment costs, \$21.75 a ton, which is a rather heavy handicap on mining in Franklin Camp."

The following notes concerning mining in region of Beaverdell and Carmi, on the west fork of Kettle River, were printed in the official "Preliminary Review," issued early in February: "On Wallace mountain, near Beaverdell, several properties were worked under lease and bond, and ore shipments were made via the Kettle Valley Railway to the Trail Smeltery. The Bell was leased to Robert Perry, who shipped two cars of ore which is said to have returned very high value. The Sally was also worked under lease and some ore shipped. The Rob Roy, one of the claims in the Sally group, was bonded during the year and work is now being done on it. The Carmi mine and stamp-mill at Carmi remained idle during the year, but another property near the Carmi was worked under lease and bond."

#### COBALT AND PORCUPINE.

##### Nipissing.

The month of January was a good month for the Nipissing Mining Company of Cobalt. The production was considerably less than normal, owing to the fact that the annual clean-up, certain repairs and changes necessitated the shutting down of the mills for a short period. Underground work, however, proceeded without any interruption, and proved very satisfactory. Development at shaft 73, on vein No. 490 consisted of sinking two winzes below the fifth level. The south winze reached a depth of 41 ft. where it encountered the Keewatin, stoping was then commenced. The ore continued to the Keewatin but was low in grade after about 21 feet. The north winze is being sunk on a vein averaging six inches in width of from 1,000 to 2,000 ounce ore. Cross-cutting from the fifth level has been done with the object of determining the existence of parallel veins. So far none have been encountered. The company mined ore of an estimated value of \$173,988, and made shipments of Nipissing and Customs ore of an estimated value of \$301,692.

##### Anchorite.

The Anchorite property in Deloro Township, about one mile southwest of the Dome Mines is showing up well under development which is being conducted by the Coniagas Mining Company of Cobalt. At the 100-ft. level two parallel veins have been encountered about twenty feet apart. These veins are said to carry from \$11 to \$15 per ton in gold and the rock intervening is said to be highly mineralized. Assays are being made of this, and if it is found that ore of commercial value is made by mixing the vein matter and intervening rock, development similar to that in progress in the "Glory Hole" at the Dome will be undertaken. It is understood that a trial run of one hundred tons of the ore will be sent to either the Dome Lake or the McIntyre mill for treatment.



Now Nearly Ready

## Canadian Mining Manual, 1916

A year ago our first edition of the "Canadian Mining Manual" was exhausted and we published early in 1916 a second edition, enlarged and revised up to date. This second edition, covering the year 1915, received very favorable notice in England and the United States as well as in Canada. Our endeavor to carry to other countries reliable information concerning Canada's mines and minerals received considerable praise. The "Manual" is evidently helping to establish faith in Canada's mineral resources.

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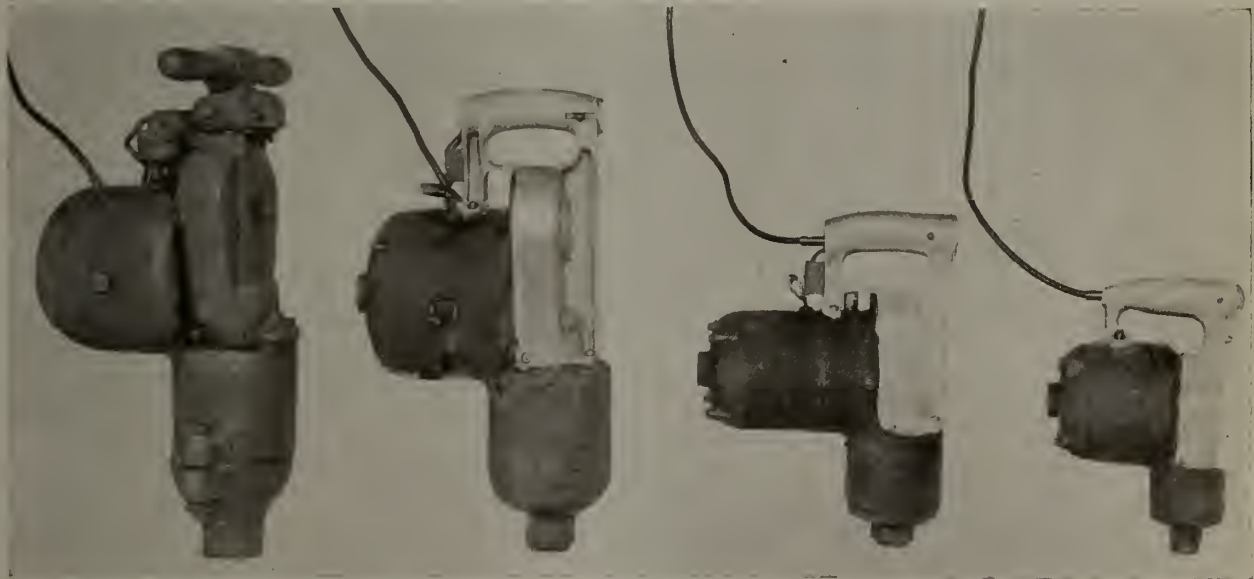
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The Hudson Bay Mining Company, of Cobalt, are at present raising on two veins from the 65-foot level. These veins are from two to three inches wide and contain very high grade ore, which is characteristic of the Hudson Bay. The two veins merge into one where the crosscut encountered them; but as raising proceeded, it was found that they were two separate veins. One is believed to be the vein discovered on the surface of the property last year, shortly after the company resumed work.

### **Beaver Consolidated.**

Developments at the Beaver Consolidated since the discovery of the high grade vein at the 1,600-ft. level have included cutting a station with considerable speed. The high grade values were well maintained in the vein so far as opened which averages about six inches of 1,500 to 2,000 ounce ore with high grade milling ore across a width of from two to eleven feet. The ore so far developed adds considerably to the reserves of the mine. The Temiskaming property on which the shaft is being sunk to the 1,800 ft. level adjoins the Beaver. It will be necessary to sink to a deeper level than 1,600 ft. on the Temiskaming as the formation through which the Beaver went before they got the enrichment is somewhat deeper on the Temiskaming, owing to the rolling nature of the diabase in this section of the camp. When the 1,800 ft. level is reached on the Temiskaming, it is planned to do considerable exploration work.

### **Power for Kirkland Lake Mines.**

With the completion of the Northern Ontario Light and Power company's electric transmission line to the Kirkland Lake camp and the turning on of the power two weeks ago a new era was opened up for the mines of this section of Northern Ontario. A number of properties in the camp are already availing themselves of the new supply of energy and have connected up their plants with the electric line. From this time on the progress of development will be much more rapid than in the past.

### **White Reserve.**

The White Reserve mine in the Maple section of the Elk Lake district is now working with a force of eighteen men. The old plant has been overhauled and put in first-class shape. The shaft has been sunk to the 130-ft. depth; but the company ran out of funds before any drifting could be done to determine the value of the vein system located on the surface. The present management of the property will crosscut to these veins at the present depth, and on the results of this work will depend the future plans of the company.

### **National Mines.**

Due to trouble with the sand pumping apparatus recently installed at the National Mines, Cobalt, for the purpose of pumping the tailings from the lake to the mill the seventy-five ton oil flotation plant is not working. In the meantime a number of changes are being made in the classifiers and it is expected the new plant will be in operation about the end of next week. A Morris pump with a capacity of ten tons of dry sand per hour is on order and will be installed at an early date. Underground developments at the 1,000 ft. level of the property are being pushed vigorously, and at the present time the crosscut is close to the Silver Cliff property.

### **Hollinger.**

The four-weekly report of the Hollinger Gold mines ending February 28th, shows a falling off in production from that of the preceding period of \$7,957. The gross profits for the period were \$217,100, which was some \$30,000 less than dividend requirements.

The mill treated 48,119 tons of an average value of \$8.71 per ton. These figures compare with 49,616 tons of an average value of \$8.49 per ton for the preceding period. The mill ran 85.5 per cent. of the possible running time. The operating costs for the four weeks were slightly higher than for the preceding term, being \$3.88, which exceeded last month's costs by 11 cents per ton. \$71,279 was spent on the plant.

Inability to obtain sufficient balls for the ball mills, shortage of labor, delay in delivery of parts and extensive alterations and additions in progress are given as reasons for the curtailment of production.

### **Mining Corporation.**

The Mining Corporation of Canada sent out what is estimated to be the richest carload of ore that ever left the Cobalt camp. The car contained between twenty-two and twenty-three tons, carrying approximately seven thousand ounces per ton of silver and was valued at \$175,000. The Temiskaming mining company sent out a car load of silver ore about a year ago which contained more silver, but as the price was considerably lower than that prevailing recently the value of the car was much less.

### **Boston Creek.**

A large building program is being carried out at the Boston Creek mine, the premier property of the Boston Creek camp. Lumber and other building materials in large quantities are arriving and it is the intention of the company to erect a large shaft-house, camp buildings and offices. The quarters for the men will be erected in such a manner as to accommodate about two hundred men.

A winze is being put down from the 200-ft. level and is now down about ninety feet, and is understood to be in good ore.

### **Gowganda.**

The Gowganda Power Company have a large gang of men at work on the erection of their power plant at Hanging Stone Falls. A dam is being built for the purpose of developing from 400 to 500 h.p. which will be used to build the 6,500 ft. tunnel from the east branch of the Montreal River to Hanging Stone Creek. This tunnel will divert enough water from the Montreal River to generate 1,500 h.p. for the use of mining companies operating in the Gowganda district. It is also understood that the power company have purchased the Bartlett properties in the immediate vicinity of their plant and will develop same. This property is considered one of the most promising in the Gowganda district.

### **Staking Claims in Thackeray.**

About forty or fifty claims have been staked in the Township of Thackeray, which lies about twelve miles north-east of Bourkes Siding. Some free gold has already been discovered. The rock formation in this district is Keewatin. There are a large number of quartz veins in evidence, and it would not be surprising if some good discoveries were made. The township of Thackeray is about twelve miles north of Teek and Level, and about ten miles south of Lake Abitibi.



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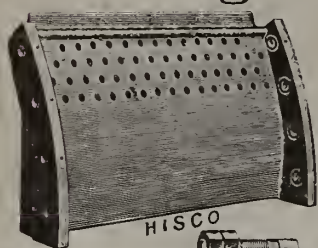
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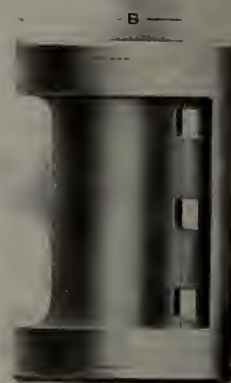
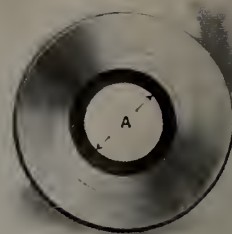
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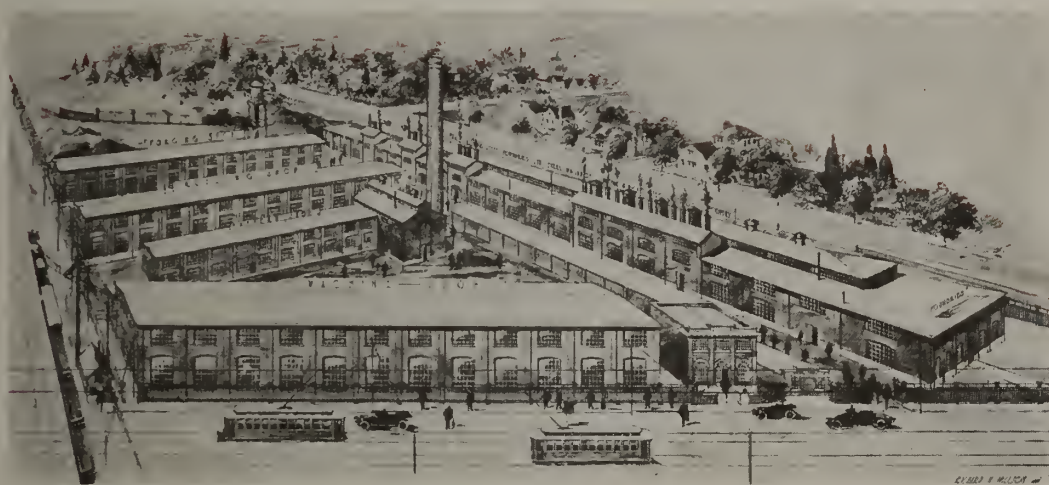


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TORONTO

No. 7



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- The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.
- Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.
- Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
- Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.
- Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

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- Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.
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- Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

### GEOLOGICAL SURVEY

#### Recent Publications

- Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.
- Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.
- Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.
- Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.
- Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.
- Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.
- Memoir 81. The Oil and Gas Fields of Ontario and Quebec, by W. Malcolm.
- Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.
- Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.
- Memoir 85. Road Material Surveys in 1914, by L. Reinecke.
- Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.
- Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.
- Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.
- Ontario. Topography.
- Map 59A. Wheaton, Yukon Territory.
- Map 66A. Brechin Sheet, Ontario and Victoria Counties.
- Map 150A. Ponhook Lake Sheet, Nova Scotia.
- Map 153A. Asquith and Churchill Townships, Sudbury District, Ontario.
- Map 158A. Nanaimo Sheet, Vancouver Island, British Columbia.
- Map 175A. Ymir, Kootenay, British Columbia.
- Map 181A. Wood Mountain-Willowbunch Coal Areas, Saskatchewan.
- Applicants for publications not listed above should mention the precise area concerning which information is desired.
- Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.
- The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.
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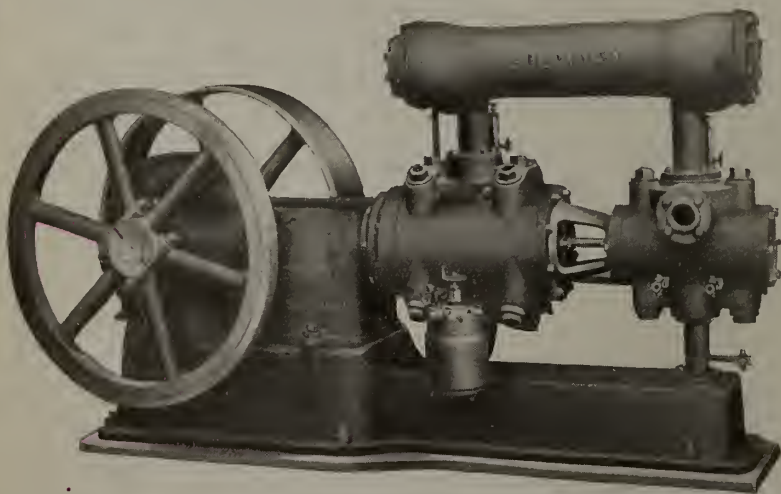
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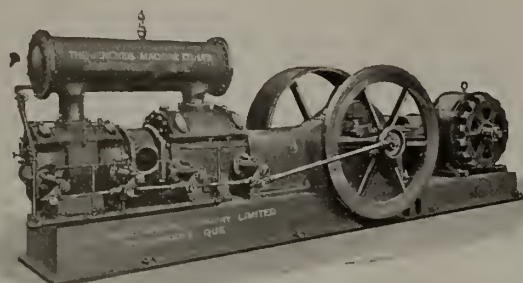
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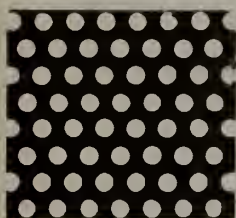
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The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

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**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of \$10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of \$5 an acre for SUPERIOR METALS, and \$3 an acre for INFERIOR MINERALS.

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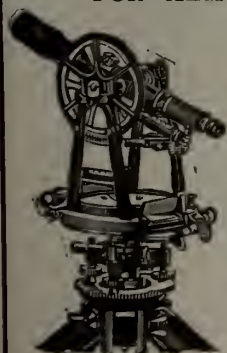
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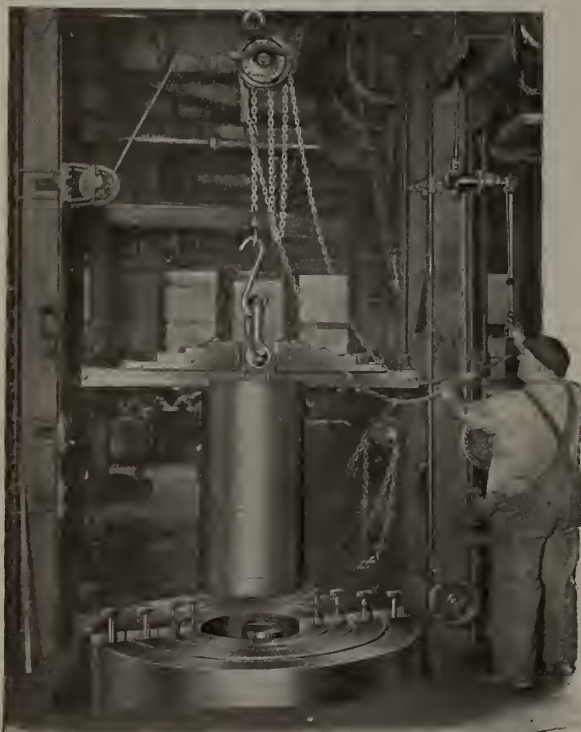


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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, April 1st 1917.

No. 7

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

Head Office - - - 263-5 Adelaide Street, West, Toronto

Branch Office - - - - - 600 Read Bldg., Montreal

Editor

REGINALD E. HORE

SUBSCRIPTIONS — Payable in advance, \$2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, \$3.00 a year.

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### CIRCULATION

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### INDEPENDENT REPORTS NEEDED.

The Dome Lake episode emphasizes the need of independent reports on mining properties. Shareholders who read the report of the former manager of the Dome Lake Mining Co., and assumed that it was reliable, doubtless imagined that the property was in very good shape. The new manager was unable to confirm last year's report, however, and his findings must have caused dismay among the too confident shareholders.

In the case of Dome Lake there had been persistent rumors for some months to the effect that the results of development last year were not very satisfactory. It was, therefore, somewhat of a surprise when the management announced that a large tonnage of \$9 ore had been placed in sight, and that the mill was expected to be treating by November 10, 200 tons daily. The statements thus officially made were of course accepted in good faith, but the new manager's report makes it appear that they were not justified. In order to clear up the situation an independent report should be demanded by the shareholders.

As a rule shareholders of mining companies operating in Northern Ontario can keep themselves fairly well posted as to conditions at the properties. Even in the case of some important and steady producers, however, the shareholders have insufficient information for judging the value of their holdings. Independent reports by engineers employed by groups of shareholders would serve as a check on the estimates made by those in charge of the operations. In many cases there is little such special reports, and the necessary expenditure would not be justified, but in some cases at least the money would be well spent.

It is common practice for mining companies, like other companies, to have their books audited. Would it not be advisable to require that estimates of ore reserves be audited by properly qualified engineers. The ordinary auditor is dissatisfied until he has accounted for every dollar and even every cent shown on the books as expended and received, but he has an amazing disregard for the accuracy of the estimated value of the chief assets.

### MISLEADING REPORTS OF EXPORTS.

The mysterious methods of our Department of Customs have been referred to before in these columns in connection with the reports on nickel exports. Nickel is, however, not the only item that is strangely dealt with.

In the list of exports of mine products in 1916 we find the following:

Gold-bearing quartz, dust, nuggets, etc, \$18,382,903; silver, metallic, contained in ore concentrates, etc, \$15,637,885; nickel, fine, contained in ore, matte or speiss, \$8,662,179.

The Department of Customs seems to be endeavoring to conceal the actual character of our exports. Most of our gold is exported as bullion; four-fifths of our silver is exported as bullion, and nearly all of our nickel is exported in the form of matte. The Department of Customs seems to wish it to be understood that gold-bearing quartz and nickel ore are exported in large quantities. Such substances are rarely exported from Canada.

Not content with the misleading description of the character of our exports the Department of Customs continues to report ridiculous estimates of the value of the nickel matte exported. We exported copper-nickel matte in 1916 worth at least \$30,000,000. The nickel content was worth at least 25 cents per lb., or over \$20,000,000 for the 41,299 tons matte exported, yet the Department of Customs estimates the value at \$8,662,179.

Ontario produced in 1916 nickel-copper matte containing 41,299 tons nickel and 22,430 tons copper. The nickel, when refined, would be worth about 35 cents per lb., or \$28,909,300. The copper would average about 25 cents per lb., or \$11,215,000. The refined products were therefore worth about \$40,000,000. It is obvious then that the Department of Customs' estimate of the value of the nickel in the matte is absurdly low.

The Toronto World in its issue of March 23, printed the following:

"The annual report of the trade and commerce department for the fiscal year 1915-16, issued today, shows that the nickel export was as follows: To Great Britain, 11,610,100 lbs., valued at \$1,779,801; to United States, 58,832,900 lbs., valued at \$5,934,968."

We are not surprised that the World has given this item a prominent place on its front page for our contemporary has taken a leading part in attempting to inform Canadians of the facts concerning our nickel industry. On more than one occasion, however, we have had to point out that our contemporary has been misinformed. This dispatch from Ottawa is similarly misleading. In this case the World has assumed that the figures published by the Department of Trade and Commerce are reliable. This is perhaps a reasonable assumption, but is unfortunately a false one. The Department of Trade and Commerce, if we are correctly informed, does not itself collect the statistics on exports which it has given the World, but republishes the absurd statements issued by the Department of Customs. In consequence of this unfortunate practice we have spread before the Canadian public the statement that 58,832,900 lb. of nickel contained in matte shipped to the United States during the fiscal year 1915-16 is valued at \$5,934,968, or less than 11 cents per pound. As a matter of fact it should be valued at, at least, 25 cents per pound. Why should we not get proper credit for our exports? Why do our Departments persist in publishing misleading figures?

## MINING TAX AMENDED.

It is understood that the Ontario Mining Tax Act is to be amended, the tax on profits being raised from 3 to 5 per cent. On profits over \$5,000,000 the tax is to be 6 per cent. and on over \$10,000,000, 7 per cent. Allowance for depreciation is to be increased from 10 to 15 per cent. In the case of nickel companies the Act is made retroactive to January 1st, 1915.

Under the new Act the Canadian Copper Company will be required to pay its proper share of taxation and will contribute several hundred thousand dollars yearly, instead of the ridiculously small sum which it has been paying. This company will have the honor of being all alone in the 7 per cent. class.

## CORRESPONDENCE.

### Contributions of the Mond Company and Employees.

Editor Canadian Mining Journal:

Sir,—The action of the Mond Nickel Company, in connection with recent Government war loans, may be of interest to your readers, or be suggestive to other companies producing war materials. The company itself was reported by the daily press as having subscribed two and a half million pounds sterling to the British loan. In addition, it offered easy facilities to its employees in Great Britain and Canada to subscribe to either the British or the Canadian war loan. Any employee was permitted to invest in war bonds up to one-half his yearly earnings, the investment to be repaid to the company, without any charge for interest, in twenty-four monthly instalments of \$4.00 each for each \$100 bond (for the Canadian loan). Employees in this way will receive interest on the full amount subscribed, but will have two years in which to pay for the bonds. Employees may at any time within the two years notify the company if they desire to discontinue payments and have the amount already paid in by them returned in full, without any deduction for interest on the bonds already received by them. The employees of the company at the mines and smelter near Sudbury took advantage of this generous offer to the extent of more than \$110,000.

Early in the war many of the company's employees in Canada organized, for systematic voluntary monthly giving to the various patriotic funds, and petitioned the company to deduct from their monthly earnings a definite percentage from each month's pay until some months after the war is ended. Committees of the men at the different centres decided on the distribution among the various patriotic funds, of the money thus raised—the company merely acting as their banker. In this way the employees have raised up to March 1st, \$37,644.

One hundred per cent. of any surplus profit made by the company during the war goes to the British Treasury.

C. V. CORLESS.

Coniston, Ontario, March 22nd, 1917.

Mr. Hallet R. Robbins, for some time a member of the faculty of the State College of Washington, Pullman, Washington, in the capacity of assistant professor of mining engineering, is now on the engineering staff of the Granby Consolidated Co., at Vancouver, B.C.



**PYRITES.**

There are in Ontario and Quebec important pyrites mines.

The chief producing pyrites mine in Ontario is the Northern Pyrite mine at Graham station, on the G. T. P. Ry., which is shipping at the rate of 125,000 tons a year. During 1916 the mine was being equipped for increased production and consequently the output was only about one half normal. The largest producer in 1916 was therefore the Gondreau mine, operated by the Madoc Mining Company. The Gondreau is located on the Algoma Central railway, north of Sault St. Marie.

In Eastern Ontario, at Queensboro, an excellent deposit of pyrites is being worked by the Canadian Sulphur Ore Co.

Quebec has been producing pyrites in large quantities for many years. The Quebec pyrites carries considerable copper and a little gold and silver. The chief producers are the Eustis and Weedon mines. The Eustis mill was burned late in 1915 and the new mill was not in operation until late in the spring of 1916.

Mr. Edgar Rickard, assistant director of the Commission for Relief in Belgium, is to be in Toronto on April 14. Mr. Rickard was graduated from the University of California in 1895, taking post-graduate work the following year, and after serving the usual apprenticeship as assayer and surveyor in various parts of the United States, went to Tasmania in 1899 as resident manager of the Briseis Tin Mines; 1900-1901, examination work in Mexico, Alaska and U. S. A. In 1902 to 1905 he was superintendent of the Progreso Mine in Lower California, Mexico. In 1905 he became business manager of the Mining and Scientific Press, and in 1909 managing director of the Mining Magazine, London. At the opening of the war he served on the executive committee of the American committee under Mr. Hoover, looking after the American refugees in London, and was asked by Mr. Hoover to join the Commission for Relief in Belgium at its inception, October, 1914, serving as honorary secretary up to October, 1916, when he came to New York to act as assistant director.

**C.S.C.E. APPOINTS A NEW SECRETARY.**

Montreal, March 21.—Owing to the increased importance of the work of the Canadian Society of Civil Engineers, with headquarters in Montreal, in its relation to national affairs, it was decided at the recent annual convention to appoint a secretary who could devote all his time to the society's interests. The position was offered to, and accepted by, Mr. Fraser S. Keith of Toronto, who was editor and manager of Construction Magazine. Mr. Keith is an honor graduate of McGill Faculty of Applied Science, and spent a year at the university as senior demonstrator in electrical engineering. Mr. Keith has had a wide journalistic career, having been associated with The Canadian Machinery as editor, and later as manager, 1905-6, and the following year he was editor of The Canadian Manufacturer. Subsequently he spent a few years in British Columbia, returning to Montreal in the spring of 1915.

**ONTARIO NICKEL COMMISSION'S REPORT.**

The Royal Ontario Nickel Commission, appointed on 9th of September, 1915, has presented its report to the Ontario Government. The Commissioners were: Geo. T. Holloway, London, England (chairman), a leading metallurgical expert; Dr. W. G. Miller, Provincial Geologist, and McGregor Young, K.C., Toronto. Mr. Thomas W. Gibson, Deputy Minister of Mines, acted as secretary. The report proper contains over 600 pages in addition to the appendix of 219 pages giving evidence of witnesses.

The Commissioners say that in their opinion:

"(1) The nickel ore deposits of Ontario are much more extensive and offer better facilities for the production of nickel at a low cost than do those of any other country. Nickel-bearing ores occur in many parts of the world, but the great extent of the deposits in this province, their richness and uniformity in metal contents, and the success of the industry, point strongly to the conclusion that Ontario nickel has little to fear from competition.

"(2) Any of the processes now in use for refining nickel could be successfully worked in Ontario, and conditions and facilities are at least as good in this province as in any other part of Canada.

"(3) In view of the fact that practically no chemicals are required, that there is a much more complete saving of the precious metals, especially platinum and palladium, and that electric power is cheap and abundant, the most satisfactory method of refining in Ontario will be the electrolytic.

"(4) The refining of nickel in Ontario will not only benefit the nickel industry, but will promote the welfare of existing branches of the chemical and metallurgical industries, and lead to the introduction of others.

"(5) The methods employed at the Ontario plants of the two operating nickel companies are modern and efficient, although there are differences in both mining and smelting practices. It is the consistent policy of both companies to adopt all modern improvements in plant or treatment. Even during the present time of acute pressure the Canadian Copper Company has materially increased its output without substantial enlargement of its plant, and the losses in smelting are less, both at Copper Cliff and the Mond plant at Coniston, than they were a year ago. These companies have each had their experimental stage, neither has asked nor received any Government assistance, and both have earned the success which they have achieved.

"(6) The present system of mining taxation in Ontario is just and equitable and in the public interest, and is the best system for this province. Any question of change is rather one of rate than of principle.

"(7) Experiments have been undertaken by the Commission in the production of nickel-copper steel direct from Sudbury ore, and also in the electrolytic refining of nickel. Certain improvements in the latter process have been made the subject of application on behalf of the Government of Ontario for patents in Canada, the United States and Great Britain."

**DEEP DRILLING AT SUDBURY.**

Deep drilling of the Frood Extension property owned by the Mond Nickel Company, is to be undertaken. The hole will be put down 3,000 ft. Smith and Durkee of Sudbury will do the work.



**MINERAL DEPOSITS NEAR KINGSTON, ONT.\***

By M. B. Baker.

It has been frequently stated that there is probably no other area of equal size, which has produced such a variety of economic minerals as has that contiguous to Kingston, Ontario. Within fifty miles of this city there has been produced from time to time the following products: Mica, phosphate, graphite, gold, arsenic, copper, iron, lead, zinc, barite, talc, corundum, feldspar, quartz, actinolite, molybdenite, fluorite, pyrite, building bricks, lime, cement, building stone and road metal.

It is a fundamental principle of economic geology that all metalliferous as well as other constituents of rocks have been derived ultimately from the interior of the earth, have been brought to or near the surface through igneous activity, and have there suffered, as a rule, further concentration by natural processes, to become of economic value. With three periods at least, of igneous activity proven in pre-Cambrian times, namely, the Laurentian, the Algonian, and the Keweenawan, it is not surprising that these rocks should carry economic deposits of considerable variety and substantial value.

**Feldspar.**

Among the intrusive rocks in the Kingston area are the pegmatites of late Algonian age. These are found cutting the large main masses of Algonian granite, as well as the earlier Laurentian and Grenville series. They are very coarse grained as a rule, so much so that their chief constituents, feldspar and quartz, are mined separately in large quantities. This is only possible where these dikes cut gneisses, in which case they yield a beautiful feldspar carrying 13 per cent. of potash. These dikes have generally a pink colour and are very coarse grained. Most of this feldspar is mined about Verona and Bedford, on the Canadian Pacific railway, and is shipped from there to the United States, to be used for glazing white earthenware dishes, lavatory equipment, terra-cotta tiling, electric insulators, reflectors, etc. The quartz is shipped to the Niagara peninsula for use in the various silicon combinations, so largely manufactured there. A more recent use of the second grade of feldspar is for the extraction of its potash for the manufacture of artificial fertilizers. This industry may be considerably developed in the near future.

Where Algonian dikes cut Grenville crystalline limestones, they are no longer pink, but white or bleached, and do not show the constituents segregated into masses fit for mining; but, on the contrary, exhibit the most intimate mixture of their quartz and feldspar. Much of it is actually graphic granite, where the most pronounced intergrowth is evident. The feldspar in this case is no longer the potash-rich orthoclase and microcline, but is a pale to white oligoclase, which carries about 6 per cent. of potash and 3.5 per cent. of soda. From these facts it is clear that the Algonian pegmatites are of economic value where they cut gneisses, but are of no worth where they cut the crystalline limestones. This fact should prove instructive to prospectors in the search of additional supplies of feldspar in this and adjoining areas.

**Mica and Phosphate.**

Southeastern Ontario has long been known as an important producer of amber mica. In the "Geology of Canada," issued by the Geological Survey of Canada in 1863, reference is made by Sir William Logan to the occurrence of mica in this region. On page 796

is a brief statement of important mica occurrences in Ontario, and the paragraph closes with this statement: "It appears probable that by further exploration in this region, and in Grenville, sufficient quantities of mica could be obtained to supply a large demand."

All early reports of mica occurrences speak of its association with phosphate, and the phosphate industry flourished long before the mining of mica was carried on. In 1868 apatite was mined by the Rideau Mining Company in North Burgess township, and was shipped to Germany. It then brought seven dollars per ton. In 1871 apatite was discovered in the township of Loughborough by H. G. Vennor. Mica then began to be mined as a by-product in the phosphate industry. It was not, however, until after 1890 that there was any appreciable demand for mica. Of the great amount that had been mined in the phosphate industry, and thrown on the dumps, only a very small portion of the choicest sizes procured a market.

After 1890 both mica and phosphate found sale for a while, but the placing of the easily mined phosphates of the southern States on the market soon stopped the sale of the harder and more costly phosphate of southeastern Ontario. The mica industry continued to grow, however, and has been a valuable one ever since. It is not the writer's intention to deal in detail with this industry, a monograph, No. 118, having been issued by the Department of Mines, Ottawa, in 1912, which is full of information for those who wish it in detail. There are certain points, however, regarding the origin of mica and phosphate deposits that do seem worthy of note here. The detailed mapping of this area gave the writer an opportunity to study, and aid in deciding, some much debated points as to the origin of phosphate and mica deposits in pre-Cambrian rocks.

It is probably natural that the first theories of origin suggested for phosphate should be organic, and early Canadian geological literature assigns this theory. Vennor, G. M. Dawson, Fielding, Davidson, J. W. Dawson, and Harrington claimed that the phosphate deposits were derived from organic remains, originally present in the sedimentary gneisses and limestones in which they are now found. History repeats itself, and, as in all similar discussions, an exactly opposite view was soon put forth by other geologists. Quite in contrast with the organic theory was the theory that these deposits were of purely igneous origin. This theory has been supported by Selwyn, Bell, Ellis, Coste, and others.

Coste sums up the matter thus: "We believe we have gathered year after year strong and clear evidence to show that not only our deposits of iron ore in Archean rocks, are of eruptive or igneous origin, but also that our deposits of phosphate are exactly similar, and have also the same origin."

Two theories more opposed in character, could not have been put forth to explain the same phenomenon, but there was considerable evidence for each, and from the study of individual deposits, it would be almost possible to prove either theory. The writer, after mapping this area geologically, saw certain relationships which show that both of these theories are partially correct, but that a combination of the two is necessary to account for the deposits satisfactorily. Certain essential ingredients were present in the sedimentary rocks as claimed by the first school; while certain other ingredients were introduced by the igneous activity, and the aqueo-igneous combination produced the results now found.

\* Extracts from a report published by the Ontario Bureau of Mines.



Deposits carrying phosphate and mica are often of quite irregular shape, the so-called "pockets." As a rule they are rather vein-like in that they follow the strike of the gneisses, or the contacts of the gneisses with crystalline limestones. A few deposits do cut across the general rock structure at an angle. Generally there are no walls, or sharp contact planes, between phosphate deposits and their surrounding rocks. The beds are extremely irregular in shape, and only rarely does anything like a true vein show. The deposits are usually made up of pyroxene, phlogopite, apatite, and calcite, named in the order of their crystallization. Many of the mica deposits are free from calcite, and some are free from apatite or phosphate, but none are free from pyroxene.

This has led to the common statement that our mica and phosphate deposits are found in "pyroxenites," and these pyroxenites have been described as intrusive, plutonic masses of coarse crystallization, which have intruded the gneisses and crystalline limestone. This is what a pyroxenite should be, but not what these actually are.

The writer got his first hint as to the explanation of the origin of these deposits while examining a contact of Algoman granite with Grenville crystalline limestone on lot 5, concession VI., of township Storrington. The contact was a clean one between these two rocks. Along the contact were developed scattered crystals of pyroxene, phlogopite, apatite, calcite, scapolite, graphite, and other minerals, showing clearly that these minerals had developed as contact metamorphic crystallization, and were the result of a siliceous magma coming in contact with a dolomitic limestone country rock. The lime and magnesia acquired from the dolomite formed with the silica of the intrusive the minerals found in these so-called "pyroxenites;" the necessary amounts of alumina, iron oxides, and alkalis, being just as easily accounted for as the more abundant constituents.

In the Kingston area Laurentian granites intruded the Grenville limestone and lime-holding sediments in great amount; and these intrusions usually produced an elongated lens-like, or plate-like shape, depending upon the perfection with which they followed the structure of the pre-existing gneisses and schists of Grenville age. It is obvious therefore that the contacts would be vein-like in shape, as a result of following the gneissic structure of the country rocks. Thus the shape of the so-called "pyroxenite dikes" or mica veins is accounted for. They are simply contact metamorphic deposits produced by the intrusion of the siliceous Laurentian granite into the basic Grenville limestone, rich in lime and magnesia.

Testing this theory the writer then traced the contacts of the main Laurentian belts with the crystalline limestone, and was astonished to find how perfectly the economic deposits of mica are strung along such contacts. In many cases the contact produced a rather compact, fine-grained, crystalline rock, composed largely of pyroxene, mica and apatite, which could very easily be taken for a pyroxenite. Its position would appear to be intrusive into the Grenville limestones and gneisses, as has been so frequently claimed. At other places, more open and spacious contacts would develop the large crystals for which this class of deposits is famous. Mica crystals measuring six feet across the base have been found in the Canadian General Electric Company's mine at Sydenham. Pyroxene crystals six inches square and eighteen inches long; apatite crystals ten inches in diameter; sphene four inches in cross section; zircon half an inch to a side

and an inch and a half long, and other crystals of similar dimensions, have made these deposits famous as collecting ground for mineralogists.

The bulk of the deposits are of course along the contact in vein-like bodies, but certain fractures cross the gneiss and bedding planes of the crystalline limestone, giving rise to the so-called "cross-fissures," or dikes, which cut the structure of the country rock. It is clear that the size of the crystals, and therefore the economic value of the mica deposits, depends on the openness of the ground in which the crystals grew. Great areas, therefore, of so-called "mica rock," pyroxene and phosphate, are found which yield no marketable mica, and are readily taken for basic intrusive igneous rocks. They are too dense and compact to have given opportunity for the development of large crystals and are therefore of no economic value. The writer would, therefore, advise prospectors for mica to search out contacts of crystalline limestone with Laurentian gneisses, and following along these contacts, searching for places where sufficient openings or spaces were formed to allow for the growth of large crystals. That the granite intrusion which caused the metamorphism and mineralization, was Laurentian in age, and not Algoman, is certain, because both Algoman and Keweenawan dikes cut these mica-phosphate deposits.

It has been stated in the literature, and more frequently by mica miners, that mica is "pockety," and only "superficial" in its development, and that it will "not go deep." These statements are only partly true. There is no reason to limit the depth to which mica may be found, but it is such an easily cleavable and very fissile mineral that, at depth, mica crystals are apt to slip and be wrinkled or crumpled by pressure, which renders them useless for economic purposes. Just as one often says that certain segregated ores have a commercial wall, so one can say that mica has a commercial depth. If there has been no serious pressure to deform the mica physically, there is no reason why it should not follow indefinitely down the contacts on which it has formed.

### Lead and Zinc.

In the year 1870 an outcrop of galena was found on the south half of lot 16, concession IX., of Loughborough township. It was worked in a desultory fashion, by the local inhabitants for five years. Sufficient galena was shown to attract an English company, and in 1875 the Frontenac Lead Mining and Smelting Company was formed. This company sank a shaft 250 feet deep, and ran five fifty-foot levels. In five years it took out over 2,000 tons of ore, which was reported to average 12 per cent. in lead, and five ounces of silver to the ton of galena.

This company traced the vein to the northwest for about three-quarters of a mile, and opened up two other shafts, showing a mixed ore of galena and zinc blende. The ore at the original opening, or No. 1 shaft, was entirely galena. The vein was traced, also, to the southeast into concession VIII., a distance of nearly a mile, where the large mass of Algoman granite, shown on the map, is met with, and where the vein showed no further development. At shaft No. 1 the wall rocks are gneiss, partly Laurentian in age and partly Grenville in lit-par-lit intergrowth. This country rock extends southeast to the Algoman intrusive. Following the vein northwesterly from No. 1 shaft, it passes into a small swamp, and when it emerges at the other edge, the wall rocks are Grenville crystalline limestone. The contact between the gneiss and crys-



taline limestone lies in the swamp and cannot be seen, but at the southwest edge of the swamp a belt of pyroxene phosphate rock is developed, carrying mica as has just been described.

The gangue of the lead vein is coarsely crystalline calcite, which makes a very striking vein in the gneiss and crystalline limestone. It is from six to twenty feet in width, dips vertically, and shows a remarkable ribboned or banded structure with the sulphides of lead and zinc. It is evidently a typical encrustation vein.

Regarding the origin of this deposit it is evident that the opening is not the result of solution, for the vein is a distinct fissure at least one and a half miles

### Paving and Building Stone.

The Algoman formation around Findlay station, on the Grand Trunk railway, possesses such splendid joining that it has been quarried for building stone and the smaller blocks have been chipped to cobble-stone size and sent in car-lots to Montreal, Toronto, Ottawa and other places to be used for paving purposes. Both the granitic and syenitic phases of the Algoman have been used from this vicinity and both yield an excellent cobble stone. Larger blocks, the quality of which is excellent, have been, and are still, quarried for building purposes.



Geology and Mineralogy Building, Queen's University, Kingston, built of Black River limestone.

long, and with distinct strike and dip, sharp clean-cut walls, no impregnation of the country rock by ore or gangue, and cuts at least one contact between gneiss and crystalline limestone, across their general strike. It is clearly a fracture of post-Laurentian age. Towards the southeast the vein soon meets the great Algoman batholith south of Perth Road. In other parts of southeastern Ontario north and west of this area, the Algoman has been shown to be the immediate cause of certain gold-bearing quartz bodies, and these auriferous quartz bodies often show galena as an accompanying constituent, for example, the Belmont, Deloro, Ore Chimney, Big Dipper, and other gold deposits. The Algoman granite intrusion, therefore, possibly caused the fracturing, and produced the space necessary for the orebody; while the mineralizers that accompanied the end action, or pegmatitic phase of the Algoman, could contribute the ore filling; the highly calcareous Grenville country rock would contribute the gangue of calcite.

### Building Stone.

As already mentioned, the Algoman granites and syenites around Findlay have been quarried into large blocks and shipped for building purposes. Algoman granite was also quarried at Barriefield and good red granite blocks were obtained. A solid, fresh, even-grained Algoman mass would yield good building stone in most places. Only rarely does it show any gneissic tendency, it is for the most part massive, and its remarkably good jointing makes quarrying a rather easy matter.

The Potsdam sandstones, particularly the red ferruginous sandstone, has been quarried and used for decorative stone in brick buildings, and at other times for the whole structure.

The writer suggests that the buff to white lower beds of Potsdam sandstone are so free from iron and other impurities that the refuse material from a quarry might prove very valuable as a source of glass-sand. The Potsdam exposures on the St. Lawrence waterway,



on lots 28, 29 and 30, concession II., township of Pittsburgh, would be worth investigation in this respect.

Kingston has long been known as the Limestone City, owing to the fact that a large number of its homes, as well as its public buildings, are built of this rock. It is doubtful if any better building stone is to be found in Canada than the Black River beds of Kingston and vicinity. They yield a beautiful dove-blue colored stone, of very even grain and of almost any desired thickness of bed. They are remarkably free from fossils and, therefore, yield uniform, even-grained blocks. They are easily quarried almost anywhere in the vicinity and are soft and easily shaped when freshly quarried. They soon lose their quarry-sap, however, and whiten, and harden very much after exposure, giving the building a greyish-white appearance that is clean and attractive. Kingston's public buildings, churches, city hall, court house, hospital, penitentiary, Rockwood asylum, and the splendid group of Queen's University buildings, are all built of this Black River limestone. It is doubtful if any finer group of buildings for uniformity of material is to be found in the Dominion. The freedom from fossils is the chief feature of this success. For uniformity of texture and evenness of grain the writer has seen nothing to surpass the limestone of this area as a building stone. The accompanying illustration, reproduced here by courtesy of the Ontario Bureau of Mines, is of a building constructed of Black River limestone.

#### Building Brick.

The Pleistocene deposits of the Kingston area are not well suited to the manufacture of brick. The surface deposits are Saugeen clay; thin-bedded interlaminae of calcareous and ferruginous clay. The layers rich in lime burn to buff or so-called white brick; while the ferruginous layers burn to a rich red. The result is that the clays when dug are mixed up, and as perfect mixing is most difficult the product is spotted. The body of the brick is red, but buff spots of calcareous clay are scattered through it, in many cases spoiling the brick for any purpose except inside walls. If the clays can be thoroughly mixed together, the red ferruginous clay will mask the buff or white burning clay, and a good red brick will result.

#### Trap.

The Keweenawan trap dikes, of which many occur in the Kingston area, would yield the very best road metal procurable for macadam roads. Dikes on lot 18, concession IX., township of Storrington, have been quarried. As the product was mistaken for magnetic iron ore it is still on the dumps. This dike is most handily situated for mining and shipping by boat on the Rideau canal. Similar dikes occur at Washburn, also on the Rideau canal, and quite handy for water shipment. Unfortunately these dikes are of rather small dimensions, so that the supply of road metal is limited. Other larger areas of trap and basaltic rocks occur about Jones falls on the Rideau canal. These might prove of sufficient size to supply much needed road metal.

#### Lime.

The Grenville crystalline limestones have been much used as a source of lime. In the vicinity of Verona and Bedford, splendid kilns were erected and lime burned for shipment over the Canadian Pacific railway. The Ordovician limestones about Kingston would yield the highest quality of lime, but at present no kilns are being used on either class of rock except for purely

local supplies. It would be difficult, however, to find more suitable limestone or more favorable locations for shipping than are to be had in this vicinity.

#### Barite.

On lot 17, concession IV., of the township of Kingston, is a barite vein that cuts the flat-lying Ordovician limestone. At this point it is from one to four feet wide. It dips vertically and strikes northwest; it is claimed it can be picked up along this strike for a distance of fourteen miles. The limestone is dense and hard with shaly partings, and its contact with the barite is very sharp and clean; there is no transition whatever from the vein into the country rock. Moreover, along the contact is a coating of anthraxolite, and some fluorite, all of which the writer takes to indicate that this vein has not filled from the surrounding country rocks, but owes its origin to an aqueo-igneous source.

Approximately one hundred tons of barite have been mined from the east end of this vein. The mineral was ground in an old burr-stone flour mill near by and shipped as a mineral pigment for paint manufacture. Nothing has been done with this vein for over twenty years.

#### ENLARGING PLANT AT HAMILTON.

In preparation for the prosperous times which the company anticipate will prevail after the close of the war, the Standard Underground Cable Co. of Canada, Limited, is making an addition to its factory at Hamilton, Ont., which when completed and equipped with the necessary machinery, will represent an investment of \$50,000.

The new building will be devoted exclusively to the uses of the wire drawing department, and, in addition to housing the former equipment, will contain material additions of new machinery of the latest design capable of drawing wires ranging in size from No. 40 B. & S. C., which is about the thickness of a hair, to the largest size of trolley wire; also machines for grooving trolley wire and for rolling flats and squares such as are used in the manufacture of magnet wire. There will also be two new "Bright-annealing" furnaces for annealing or softening the wire after it has been drawn.

#### MINES BRANCH PUBLICATIONS.

Production of copper, gold, lead, nickel, silver and other metals in Canada during the calendar year 1915.

Production of cement, lime, clay products, stone and other structural materials in Canada during the calendar year 1915.

Preliminary report on the mineral production of Canada during 1916, by John McLeish.

#### COPPER PROPERTY OPTIONED.

The Victoria copper property near the Eustis mine, Quebec, has been optioned by C. H. Hitchcock, representing the Canadian Copper Co., of Copper Cliff, Ont. Exploration by diamond drilling is under way.

#### LA ROSE.

Work has been discontinued at the Maidens-Macdonald property in Deloro township, which was being explored by the La Rose Company.



**UTILIZATION OF PEAT—II.**

By Louis Simpson.

(Continued from March 15th issue.)

**Capital Cost of Peat Manufacturing Plant; By-Product Recovery Plant; and Power Plant.**

Peat, taken from a drained bog, contains approximately 85 per cent. moisture.

Peat, immediately before turning, contains approximately 65 per cent. moisture.

Peat, immediately before cubing, contains approximately 45 per cent. moisture.

Peat, 10 days after cubing, contains approximately 35 per cent. moisture.

Peat, 10 days after cubing, but harvested during hot weather, contains 25 per cent. moisture.

It seems preferable to designate these several grades of peat not by their moisture content—which, hitherto, has been the case—but by their dry fuel content:

Bog peat has approximately 15 per cent. dry fuel content.

Peat fuel, 10 days after cubing, has approximately 65 per cent. dry fuel content.

**Operating Period.**—In Denmark, the operations of peat harvesting, in favorable seasons, commence as early as the 6th of April. When peat is harvested for use in gas producers, excavating may be begun not only earlier, but may be continued later than when the peat harvested is intended for domestic consumption alone. When peat is to be used in by-product gas producers, the harvesting may be almost invariably commenced prior to the 10th of April, and may be continued until the end of September, or even until the end of October. Thus, 158 working days are easily available; but to be conservative, the operations of 150 days, only, are considered. Peat containing as much as 40 per cent. moisture can be used in gas producers; and since over 10 per cent. of the contained moisture may be driven out of the peat by the use of special devices, which are not costly, and which are used in connection with the bunkers which store the peat and which are located over the gas producers, it is probable that peat which, when placed in the bunkers, contains as much as 50 per cent. moisture may be used with safety.

**Number of Excavators.**—Two excavators, working two shifts of 10 hours each, should produce 1,160 short tons of 65 per cent. peat daily; providing they are operated as described in Part I. The production of each excavator should be, at least, 29 tons of 65 per cent. peat per hour, or 580 tons per day of two shifts of 10 hours. Working 150 days, one excavator should produce 87,000 tons. Two excavators should produce 174,000 tons of 65 per cent. peat, per season.

**Labor.**—The labor required per day to operate two excavator units, working double shift of 10 hours each, is as follows:

|                                                  | Per day. |
|--------------------------------------------------|----------|
| 2 Excavators: 4 operators at \$3.00 per day..... | \$ 12    |
| 4 assistants at \$2.25 per day.....              | 9        |
| 4 laborers at \$2.00 per day.....                | 8        |
| 6 Spreaders: 12 operators at \$2.25 per day..... | 27       |
| 12 assistants at \$2.00 per day.....             | 24       |
| 12 laborers at \$2.00 per day.....               | 24       |
| 2 Tracks: 8 laborers at \$2.00 per day.....      | 16       |

Total... 56 men costing ..... \$120

Thus, 1,160 tons of 65 per cent. peat are excavated, per day, at a cost of 10.35 cents per ton.

**Turning.**—Boys should be employed for this work. They should be paid by piece work, at a rate per 1,000 bricks, that will yield them (when industriously

working), \$1 per day of 10 hours. One boy can turn 15,000 bricks of the standard size, viz., 8 in. x 4 in. x 4 in. As intimated in Part I., it is proposed to increase the size of the bricks, making them as large as the boys can turn, without reducing the quantity so turned. The present standard size was fixed to suit the requirements of domestic trade, and not to suit the economy of manufacture. Under the proposed alteration, it is estimated that employment would be given to 33 boys, at a cost of 2.83 cents per ton.

**Cubing.**—Boys and young men should be employed for this work. The wages paid are based on 8,000 bricks being cubed by each operative in one day. Fifty-two boys are employed at a cost of 5.35 cents per ton.

**Loading.**—If loading is done into trailers drawn by specially constructed electric or gasoline tractors—the trailers being worked by specially constructed transportable loading machines, there would be employed: 8 men and 32 boys, at a cost of 4.45 cents per ton.

**Transportation to Gas Producers.**—This is proposed to be done by a combination consisting of specially constructed tractors, as before mentioned, drawing self-dumping trailers to certain central fixed stations, located outside the bog, and working in connection with Ambursen aerial tramways. Extra trailers would be provided, so that while one loaded set is being hauled to the central station, the other set will, in its turn, be loaded. At the central station the trailer loads are quickly dumped. The peat is then taken hold of by a mechanical loader, by which means it is loaded on to the trays of the aerial tramway, which delivers the peat into the bunkers over the gas producer, or into the receiving hopper of a breaker, which, in its turn, delivers into the aforementioned bunkers. This proposed arrangement requires the attention of 12 men, entailing a cost of 2.5 cents per ton.

**Annual Preparation of the Bog.**—This preparatory work is required in order to facilitate the subsequent seasons' operations, and includes the cost of turning and relocating the excavators. It is done by certain of the regular staff, after the work of harvesting is completed. It will cost less than 0.50 cents per ton.

**Summary of Wage Cost in Making and Delivering Peat Fuel.**

|                             | Men. | Boys. | Cost per ton. |
|-----------------------------|------|-------|---------------|
| Excavating and spreading..  | 56   | 0     | 10.35 cents.  |
| Turning. . . . .            | ..   | 33    | 2.85 "        |
| Cubing. . . . .             | ..   | 52    | 5.35 "        |
| Loading: using loaders..... | 8    | 32    | 4.45 "        |
| Transportation. . . . .     | 12   | 0     | 2.50 "        |
| Preparing bog. . . . .      | ..   | ..    | 0.50 "        |
| Total. . . . .              | 76   | 117   | 26.00 cents.  |

Calculated upon an annual production of 174,000 short tons of 65 per cent. peat per year.

**Cost of Plant.**

|                                                                          |           |
|--------------------------------------------------------------------------|-----------|
| Peat bog and lands, including drainage: 6,000 acres at \$7.50.....       | \$ 45,000 |
| Legal and other initial organizing expenses..                            | 5,000     |
| 2 Improved excavators, with 3 pulpers, electric motor and track.....     | 30,000    |
| 6 Spreaders. . . . .                                                     | 12,000    |
| 2 Tracks, each supplied with dump cars for 3 spreaders. . . . .          | .....     |
| 2 Tracks for ends of bog, and 4 removable turntables. . . . .            | .....     |
| 2 Motor tractors, with 16 trailers, and 4 transportable loaders. . . . . | .....     |
| 4 Central stations, equipped with mechanical loaders. . . . .            | .....     |



|                                         |                 |
|-----------------------------------------|-----------------|
| Ambursen automatic aerial tramways..... | 55,000          |
| Sundries. . . , .....                   | 3,000           |
|                                         | <hr/> \$150,000 |

#### Total Cost of Manufacturing Peat.

|                                                                                                      |        |
|------------------------------------------------------------------------------------------------------|--------|
| Power.—Taken from our own power plant, 150 E. H. P., for 6 months at \$10 per E. H. P. year. . . . . | \$ 750 |
| Taxes.—Municipal, school, and provincial....                                                         | 2,000  |
| Repairs. . . . .                                                                                     | 4,000  |
| Gasoline, lighting, oil, and sundries.....                                                           | 5,000  |
| *Depreciation—7½ per cent. upon \$100,000..                                                          | 7,500  |

Total cost per ton on yearly output of 174,000 tons of 65 per cent. peat at 11.07 cents... \$19,250

Wages cost per ton on yearly output of 174,000 tons of 65 per cent. peat at 26.00 cents 45,490

Grand total (37.07 cents per ton).... \$64,740  
(To be Continued).

### BOOK REVIEW

**SUBSIDENCE RESULTING FROM MINING.** Young & Stock. University of Illinois Bulletin. Bulletin No. 91. Published by the University of Illinois, Urbana. Chapman & Hall, Ltd., London, European Agents.

The University of Illinois has issued a work on "Subsidence Resulting from Mining," by L. E. Young and H. H. Stock, which contains much valuable data on a subject that is a constant source of trouble to coal miners, especially where coal mines are worked in populated districts. The work is a result of a co-operative agreement between the Engineering Experiment Station of the University of Illinois, the Illinois State Geological Survey and the United States Bureau of Mines.

Dr. Young is the mining engineer for the Illinois Coal Mining Investigations, and Mr. Stock is Professor of Mining at the University of Illinois, and was formerly the editor of that excellent mining periodical (now unhappily absorbed in another technical periodical) known first as the "Colliery Engineer" and later as "Mines and Minerals."

The work deals with the whole problem of coal mine subsidence very comprehensively, giving details of actual subsidence, shows the geological conditions that affect subsidence, reviews the historical theories relating to subsidence and makes some new contributions to the data on this subject. The work goes extensively into the technical details of filling the waste, both by ordinary stowing and by "flushing" or hydraulic filling. Full references to the legal aspect of subsidence are made. Not the least valuable feature of the work is the most extensive bibliography appended, which fills twenty-five closely printed pages, and seems to have been drawn from the mining literature of the whole world.

The University of Illinois has already achieved a reputation for its monographs on engineering problems, which will be added to by this latest publication.

The work contains some interesting references to sub-aqueous mining, and Canadian readers will note the references to work of this character at Wabana Mines, Newfoundland, and at the coal mines of Cape Breton Island.—F. W. G.

\* Note.—It is considered that the land from which the peat has been taken can be used for agricultural purposes. In that case it could be disposed of at a price equal or nearly equal to that originally paid. Hence there is no need to provide a depreciation fund with regard to the land.

### ADVANCES IN METHODS OF ORE TREATMENT.

During the week of February 19-24 the annual Northwest Mining Convention was held in Spokane, Washington. The season of the afternoon of February 23 was under the auspices of the Columbia Section of the American Institute of Mining Engineers, and at this Prof. Francis A. Thomson, head of the Department of Mining Engineering of the State College of Washington, Pullman, Washington, presented a paper entitled "Advances in Methods of Ore Treatment in the Last Five Years," the purpose of the author, however, having been to confine himself to non-ferrous metallurgy, and to touch only on those points of progress which he considered of surpassing importance. The following is an abstract of the paper.

**Flotation Concentration.**—Far exceeding all other metallurgical events in significance, actual or potential, stands the progress of froth flotation. Five years ago all of us were skeptically inclined as to the effectiveness of this method of concentration, but we were mistaken. Today the flotation process takes rank as the leading single process of ore treatment in the United States. The distribution of the quantity of ore treated as between major processes in the United States is about as under:

|                               | Tons per Annum |
|-------------------------------|----------------|
| Flotation concentration ..... | 30,000,000     |
| Copper smelting .....         | 26,000,000     |
| Gravity concentration .....   | 25,000,000     |
| Gold and silver milling ..... | 13,000,000     |
| Lead smelting .....           | 5,500,000      |
| Zinc smelting .....           | 1,000,000      |

Probably about the same proportion will apply to the World's production, except that the proportional tonnage treated by copper smelteries will be less and that by gold mills greater than is shown in the foregoing table.

It would, perhaps, be easier to show what minerals the flotation process is not adaptable for than to enumerate all to which it is being applied, for ores of gold, silver, copper, lead, molybdenum, cinnabar, tungsten, and others are being successfully treated by it, and it is proposed to apply this process to other substances as far apart as placer gold and anthracite coal.

**Electrolytic Process.**—Next in significance to flotation may be placed the electrolytic process for the recovery of zinc. In this process the zinc concentrate is roasted, and then it is leached with sulphuric acid made from the roasting-furnace gases; the solution, after purification, is electrolyzed and the zinc is precipitated on aluminum sheets, from which it is stripped and melted into ingots. The zinc thus produced is of exceptional purity and commands a higher price than that produced by distillation, to the extent of a premium of two cents a pound.

Notwithstanding the protests of the furnace-zinc men, the electrolytic zinc process is successful, and it is going to make zinc distillation look to its laurels. One great advantage possessed by the electrolytic process is its suitability for the treatment of lower grade and in certain respects more complex zinc ores than is possible by the fire method. Owners of lead mines in the West have long suffered from penalties levied for the zinc content of ores they shipped to lead smelting works. If electrolytic zinc plants shall become attachments of lead smelteries, as at



Trail, B.C., then producers may hope that zinc in lead ore may become a source of profit rather than a loss by penalty.

**Ore-dressing.**—It is also found that momentous progress has been made in the field of ore-dressing through the development of flotation; in zinc ore treatment by leaching and electrolysis, in the leaching of copper ores, and in the improvement of copper-smelting practice.

**Copper Metallurgy.**—In copper metallurgy, leaching has made great strides. Naturally, flotation has checked any tendency to leach lean sulphide copper ores. It is, however, an open question whether roasting and acid-leaching of flotation concentrate may not in time seriously invade the field of the reverberatory furnace for copper recovery.

The period under review has also seen complete revolutionary change of practice in copper converting, in the substitution of basic lining of the vessels in which the metal is blown to blister copper for the siliceous material heretofore used. It is common to figure each siliceous lining as being good for 20 tons of copper, while a basic lining is found to be good for as high as 20,000 tons, which has allowed the use of larger units and decreased the time and cost of operation.

**General.**—In the metallurgy of gold, silver, and lead there is little of note to record. One of the largest gold mills in the world is that built near Juneau, Alaska, by the Alaska Gold Mining Co., this mill having a 1,000-ton capacity. There concentration precedes amalgamation or cyanidation of the concentrate, and the plant is doing good work.

In crushing as a preliminary to concentration, the tube-mill has found general adoption, either in the conical or the short cylindrical type. The advantages of the ball mill, long in use in Europe and Australia, are now recognized in America, and American metallurgists have improved on the European type.

Another field is that of by-product recovery from smeltery smoke fume and dust. Facilities for recovering sulphuric acid are now possessed at some smelting works and at many the sulphur is now being conserved.

**Conclusions.**—In conclusion, it is found that momentous progress has been made in the field of ore-dressing through the development of flotation, in zinc ore treatment by leaching and electrolysis, in the leaching of copper ores, and in the improvement of copper-smelting practice.

If one were venturing into the field of prophecy he would predict the growth of flotation and of hydro-metallurgy with a gradual encroachment of these two upon the realm of pyro-metallurgy.

One significant feature of the progress here reviewed is that practically all of it has occurred west of the Rocky Mountains and under the direction of American engineers and metallurgists, and as the result of sound training coupled with long experience and diligent application.

Dr. E. T. Hodge, professor of geology at the University of British Columbia, recently lectured in Vancouver on "How Mountains Have Been Formed," illustrating his address with numerous instructive lantern-slide views. Later, he took part in the proceedings of the Canadian Mining Institute at the meeting of the Western Branch.

## ADDITIONS TO HOLLINGER PLANT.

Additions to plant at Hollinger Consolidated mines during 1916 cost \$599,417, distributed as follows:

### Buildings.

|                               |          |
|-------------------------------|----------|
| Mill additions .....          | \$59,217 |
| Cyanide plant .....           | 23,715   |
| Central shaft headgear .....  | 23,465   |
| Administration building ..... | 19,207   |
| Directors' lodge .....        | 9,362    |
| Transformer station .....     | 6,341    |
| Dwellings. . . . .            | 5,776    |
| Central shaft plant .....     | 4,322    |
| Fencing. . . . .              | 1,254    |
| Acme hoist house .....        | 1,111    |
| Compressor plant .....        | 449      |
| Powder magazines .....        | 386      |
| Miscellaneous. . . . .        | 942      |

### Equipment.

|                           |           |
|---------------------------|-----------|
| Central shaft plant ..... | \$183,079 |
| Mill additions .....      | 144,642   |
| Cyanide plant .....       | 44,456    |
| Transformer station ..... | 44,816    |
| Mine equipment .....      | 5,692     |
| Acme hoisting plant ..... | 5,108     |
| Machine shop .....        | 3,355     |
| Office fixtures .....     | 3,289     |
| Directors' lodge .....    | 2,606     |
| Surface plant .....       | 2,398     |
| Tailings, launder .....   | 2,217     |
| Railway siding .....      | 1,445     |
| Miscellaneous. . . . .    | 258       |
| Camp equipment .....      | 495       |

## HOUSING OF UNDERGROUND CABLES.

In placing electric cables in underground conduits or in laying them on the bottom of a body of water, frequent joints are necessary. These are apt to be weak spots both electrically and mechanically unless properly made and protected. A new and improved type of joint-box or housing for use on submarine cables has recently been developed and perfected by the Standard Underground Cable Co. of Canada, Limited, and successfully used on submarine cables supplied the Halifax Electric Tramway Co. and the City of Ottawa Water Works Department.

## SUDBURY PROPERTIES WORTH \$100,000,000.

The Ontario Nickel Commission is not in favor of Government ownership of Sudbury nickel properties and points out that to expropriate would cost about \$100,000,000.

Mr. Alex. Sharp, mining engineer for the P. Burns Co., on February 28th addressed an audience in Vancouver, B.C., on the subject of "Canada's Economic Wealth and World Power," giving prominence to the mineral resources of the Dominion.

## 70,000,000 TONS NICKEL ORE PROVEN.

According to the Ontario Nickel Commission proven ore reserves in the Sudbury field amount to 70,000,000 tons, while the total of proven, probable and possible ore is estimated at 150,000,000 tons.

The excellent report of the Ontario Nickel Commission has been received too late for review in this issue. We reprint a few extracts only.



## CONCENTRATION OF MOLYBDENITE ORES BY FLOTATION.

By F. W. Horton.

Molybdenite has the property, common in varying degree to most metallic sulphides, such as chalcopyrite, sphalerite, galena, pyrite, and pyrrhotite, of not being wetted readily by water, and, when dry and in small particles, of floating on a water surface. Moreover, like those sulphides, it is easily wetted by most oils. Further, in a pulp of crushed ore and water, oils have a preferential wetting action for particles of molybdenite as against particles of gangue minerals such as quartz, and this selective wetting action is decidedly increased if the water is slightly acidified. Particles of molybdenite so wetted with oil are covered with a buoyant water-repelling coating that materially assists their flotation. As the reasons for many of these phenomena—for example, the selective wetting action of oils and the increase of this selective action by acids—are not clearly understood, and as even an elementary discussion of the accepted theories of mineral flotation would be out of place here, the reader who wishes further information on the subject is referred to a clear and concise exposition by Hoover\*\* and to an excellent paper by Mickle.† It suffices here to say that the phenomena mentioned above are the basis on which all flotation processes depend. In many processes the area of the effective surface of flotation is increased by the liberation of bubbles of gas or air in the liquid, the surface of each bubble acting in the same way as the horizontal surface of a liquid at rest. These bubbles may be of air and may be produced by violent agitation of the pulp or by release of air from solution in the liquid by a reduction of pressure, or they may be of carbonic-acid gas formed by the action of sulphuric acid on limestone or other carbonates or by other means.

### Water-Flotation Processes.

Water flotation for the concentration of molybdenite depends solely on the fact that small dry particles of the mineral float readily on water, whereas the usual gangue material is easily wetted and sinks. They do not of necessity involve the use of oil, acid, or gas, and their application is extremely simple. The concentrators, which are of various types, consist essentially of a device for feeding the crushed ore in as thin a sheet and at as uniform a rate as possible onto a moving water surface in a tank and an arrangement, either by an overflow or a revolving belt of canvas or other suitable material, for discharging the floating film of concentrates into another tank. The tailings are usually drawn off from a spigot in the bottom of the first tank. In some types of apparatus the ore from the feeder is allowed to slide down an inclined plane or concave, over which a film of water is passed and from which the ore is discharged approximately in the plane of the water surface in the tank. In other apparatus the ore from the feeder falls on top of an almost submerged corrugated or canvas roller, the revolution of which carries the ore forward to the flotation surface. The object of all these devices is to place the ore on the water in a sheet only one mineral particle in depth with as little disturbance of the water surface as possible and with the majority of the particles of gangue already wetted.

Even with the best of feeding devices some particles of gangue fall on the floating film of concentrates or are otherwise mechanically entrained by it. Various methods of cleaning the film, such as allowing it to

flow down an incline into a second tank, picking it up on a roller or belt and again discharging it to a flotation surface and dividing it into a large number of parts and agitating it by causing it to flow through the teeth of a comblike obstruction, are used.

No description of any particular water-flotation concentrator is attempted here, as detailed information both as to the design and the operation of a number of different types of machines is given in papers published elsewhere.

To be concentrated successfully by water flotation, a molybdenite ore should be such as to require only medium-fine crushing to liberate the molybdenite, and the gangue should be one in which the individual particles are readily wetted. Further, if a high-grade concentrate is to be obtained the ore must be practically free from other sulphides such as pyrite, pyrrhotite, and chalcopyrite, which would be concentrated with the molybdenite. Proper treatment of the ore previous to flotation is of great importance. It should be reduced to approximately 10-mesh, or as much finer as may be necessary to liberate the mineral from the gangue, by crushing in rolls in such a manner as to make the quantity of fines as small as possible. Then if it is at all damp it should be thoroughly dried. Mechanical difficulties in the proper feeding of fine ore, and the great reduction in the capacity of the concentrators when fine material is treated exclusively, render advantageous in most instances the treating of the ore without sizing, although the capacity of the concentrators and the grade of concentrates made are considerably increased when coarse material that has been sized is treated.

The capacity of water-flotation machines varies with their type and with the character of the ore treated, and depends directly on the size to which the ore is crushed, the amount of fines made, the nature of the gangue, and the ratio of concentrates to tailings. In speaking of a particular type of concentrator, Wood says:

"A standard machine treating a 20-mesh quartz ore, using a 3-ft. width of feed and having a 4-ft. take-off belt, will vary in capacity from 1,000 to 2,000 pounds per hour, unless the ratio of concentration is low, in which case the capacity will be smaller. Some ores that possess an easily wetted gangue and call for a high concentration ratio can be fed rapidly at 20-mesh, 30-mesh, or 40-mesh. For instance, a 1 or 2 per cent. molybdenite ore in a quartz gangue will give a clean concentrate, even if the ore is fed several times faster than an ordinary sulphide ore."

The writer thinks that the capacities stated above could be had only at a sacrifice of either the recovery or the grade of concentrates obtained, and that a machine with a feed 3 ft. wide, handling 300 to 500 lb. per hour of ore crushed to pass a 20-mesh screen would be treating about the maximum quantity of material that it could separate efficiently. No figures as to cost of operation can be given, but they are presumably small as the concentrators require only moderate quantities of water and little power.

The accompanying table shows the results obtained by Wood in 10 concentration tests of five different molybdenite ores. In every test except the last, in which the ore had been slightly roasted, the recoveries were good, averaging nearly 90 per cent. In general, however, the grade of concentrates was low to medium, averaging less than 60 per cent.  $\text{MoS}_2$ . Test No. 3 is

\* Extracts from Bulletin No. 111, U. S. Bureau of Mines.

\*\* Hoover, T. J., Concentrating ores by flotation, 1912, 221 pp.

† Mickle, K. A., Flotation of minerals: Proc. Royal Soc. Victoria, vol. 23, pt. 2, 1911, pp. 555-585, abstracted by Eng. and Min. Jour. vol. 92, 1911, pp. 307-310, and vol. 94, 1912, pp. 71-76.



of special interest as it shows the results obtained by flotation of the same ore on water at different temperatures. The decided improvement in the grade of concentrates by using warm water may be attributed to the decreased surface tension of the liquid allowing some particles of gangue to sink more readily. The recovery with warm water is, however, remarkable and can be accounted for only by some factor, such as a difference in the rate of feed, that would make the tests not strictly comparable. A summary of the data obtained by Wood is given in a table which is presented below:

**Results of Concentration Tests of Molybdenite Ores by Wood Flotation Process.**

|   |                  |      |                        |                        |                                                                                                                                       |
|---|------------------|------|------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Through 40-mesh. | 2.08 | 41.38                  | 99.00                  | Colorado ore. Re-treatment would materially increase the grade of concentrates with little loss.                                      |
| 2 | Through 20-mesh. | 2.00 | 61.55                  | 92.27                  | Alaskan ore.                                                                                                                          |
| 3 | .....            | 1.87 | 45.31 (a)<br>56.70 (b) | 79.08 (a)<br>89.17 (b) | Canadian ore with a quartz and mica gangue. (a) was obtained with water at 56° F. and (b) with water at 110° F.                       |
| 4 | Through 20-mesh. | 6.66 | 63.50                  | 96.34                  | Foreign ore.                                                                                                                          |
|   | Through 30-mesh. | 6.73 | 67.42                  | 86.26                  |                                                                                                                                       |
|   | Through 40-mesh. | 6.66 | 65.50                  | 86.48                  |                                                                                                                                       |
|   | Through 40-mesh. | 8.95 | 74.60                  | 94.19                  |                                                                                                                                       |
| 5 | Through 40-mesh. | 8.65 | 30.00 (a)<br>81.45 (b) | 79.00 (a)<br>26.30 (b) | Alaskan ore containing pyrrhotite and magnetite, and low in silica. (a) was obtained with raw ore, and (b) with slightly roasted ore. |

In order to obtain data as to concentration of a molybdenite ore containing copper sulphides by this process a small-scale test was made of a sample of ore from the Whale claim, in Copper Canyon, near Copperville, Ariz. The ore consisted of a clean white quartz containing about 7 per cent. of molybdenite and 2 per cent. of copper, present largely as chalcopyrite.

After the ore has been dried and then crushed in a ball mill to pass a 40-mesh screen, it was concentrated on a laboratory-size flotation machine of the Wood type. The concentrator was so arranged that the floating film of concentrates picked up by the take-off belt was discharged to a second flotation surface from which it was allowed to run into a concentrate tank. The material that sank in the second flotation tank was considered middlings. The ore and water feeds to the machine were adjusted with the idea of causing as much chalcopyrite as possible to sink. The results of the test are given in the accompanying table.

|                                   |       |          |        |        |           |
|-----------------------------------|-------|----------|--------|--------|-----------|
| Weight, grams                     | ..... | 4,000.00 | 538.00 | 107.00 | *3,355.00 |
| Per cent. Molybdenite             | ..    | +7.10+   | 47.44  | 6.74   | .65       |
| Per cent. Cu                      | ..... | +1.93+   | 5.26   | 5.90   | 1.27      |
| Weight Molybdenite, grams         | ..... | 284.25   | 255.23 | 7.21   | 21.81     |
| Weight Cu, grams                  | ..... | 77.22    | 28.30  | 6.31   | 42.61     |
| Extraction Molybdenite, per cent. | ..... | .....    | 89.79  | 2.54   | .....     |
| Extraction Cu, per cent.          | ..... | .....    | 36.65  | 8.17   | .....     |

The great difference between the percentage of recovery of molybdenite and of chalcopyrite is of particular interest. As compared with the feed, the concentrates contained approximately seven times the percentage of  $\text{MoS}_2$ , and less than three times the percentage of copper, and the recovery in the concentrates was 89.79 per cent. of the molybdenite, as compared with only 36.65 per cent. of the copper. Inasmuch as the crushed ore had stood only a short time before treatment, so that the particles of chalcopyrite had little opportunity to oxidize, which would cause them to be more readily wetted, the author considers the widely

different results obtained in the concentration of the two minerals to be remarkable.

**Oil-Flotation Processes.**

Many of the principal processes of concentration by oil flotation are described in detail by Hoover and in numerous articles that have recently appeared in the mining press. Published data giving the results obtained by the application of these processes to molybdenite ores are extremely meager, and are practically confined to the results of treatment by the Elmore vacuum flotation system. As the Bureau of Mines at present has no equipment at its disposal for conducting tests of the various flotation processes, the concentration of molybdenite by these methods must, of necessity, be discussed here in only a general way.

Broadly speaking, oil flotation probably offers the best method of treating molybdenite ores in general, and those particular processes that have been successfully applied in concentrating ores of the other metallic sulphides would, without doubt, meet with equal success in the treatment of molybdenite. The above statement does not mean that all molybdenite ores can be successfully concentrated by oil flotation, for the physical characteristics and mineralogical composition of an ore are as important factors in determining the success of any oil-flotation process as of electrostatic or water-flotation methods. The ores best suited for treatment by oil flotation are those in which the molybdenite is flaky. From ores in which the mineral is so fine as to be almost amorphous and the gangue contains a considerable proportion of soft material, such as kaolinized feldspar, it is almost impossible to obtain a good grade of concentrates because of the flotation of some of the finer particles of gangue. Of course, if molybdenite is associated with other metallic sulphides, such as chalcopyrite, pyrite, or pyrrhotite, these are concentrated too, and must either be removed from the ore, by a preliminary treatment, or from the concentrate if a high-grade product is desired. Methods that may be employed for this purpose are discussed later. Ores containing magnetite, hematite, garnet, hornblende, or similar gangue minerals that are good conductors of electricity, and therefore are not adapted for concentration by electrostatic methods, are especially suited for treatment by flotation.

Laboratory experiments indicate that in general the particles of molybdenite that can be floated are much coarser than those of other metallic sulphides, and if finer crushing is not necessary for the liberation of the molybdenite from the gangue, material as coarse as 20-mesh may be successfully concentrated. On the other hand, there is every reason to believe that a good recovery and a fair grade of concentrates can be obtained from the treatment of molybdenite through 200 mesh because galena and sphalerite of similar fineness have been successfully treated by oil flotation. In general, therefore, oil-flotation processes are applicable to a wider range of sizes than are electrostatic or water-flotation methods, and many of them have the added advantage of large capacities from small units. For example, Hoover estimates that in one type of apparatus used in the minerals-separation process a unit consisting of six mixing boxes each only 16 inches wide and 36 inches deep will have a daily capacity of 50 to 60 tons of ore,\* presumably Broken Hill lead-zinc tailings, and a 5-ft. Elmore machine will ordinarily treat from 25 to 45 tons of crude ore in 24 hours.\*\* Capacities equal to and perhaps even greater than these

\* Hoover, T. J., Concentration ores by flotation, 1912, p. 120.

\*\* Hoover, T. J., op. cit., p. 101.



could probably be obtained in the treatment of molybdenite ores by the same units, but no definite data either as to capacities or as to costs of any oil-flotation process when applied to molybdenite ore have, to the author's knowledge, been made public. In fact, owing to the policy of secrecy adopted by most companies interested in the development of oil-flotation methods, little information is available regarding the economics of the various processes, even as more commonly applied to the concentration of the sulphides of copper, lead, and zinc. However, comprehensive data with regard to the costs of treating Broken Hill lead-zinc tailings by four well-known processes, namely, the Potter-Delprat, De Bavay, Elmore, and minerals separation, are given by Hoover. His estimates of 3s. 6d. (\$0.85) per ton as the average cost of flotation and 9s. 3d. (\$2.25) per ton as the average total cost of re-treating these tailings on a large scale form a poor basis on which to estimate the cost of treating molybdenite ores by the same processes in small plants such as might be installed at mines producing 50 or 100 tons of ore a day. It is safe to say, however, that the costs of small-scale concentration of molybdenite ores would be considerably higher than those given above.

### HOLLINGER MINING COSTS.

The following table shows the distribution of the costs of mining at the Hollinger in 1916:

| Account.                    | Labor.    | Stores.   | Totals.     | Milled. |
|-----------------------------|-----------|-----------|-------------|---------|
| General mining charges..    | \$10,513  | \$7,884   | \$18,397    | \$0.031 |
| Superintendence .....       | 35,783    | 7         | 35,790      | .059    |
| Diamond drilling .....      | 3,024     | 2,234     | 5,259       | .009    |
| Crosscutting.....           | 16,458    | 22,426    | 38,884      | .065    |
| Drifting .....              | 54,997    | 68,303    | 123,300     | .205    |
| Raising .....               | 10,353    | 11,433    | 21,786      | .036    |
| Winzes. ....                | 3,409     | 1,397     | 4,807       | .008    |
| Timbering winzes .....      | 2,322     | 2,154     | 4,476       | .007    |
| Stoping. ....               | 230,641   | 259,045   | 489,686     | .813    |
| Scaling .....               | 12,006    | 3         | 12,009      | .020    |
| Timbering stopes and raises | 38,925    | 19,109    | 57,135      | .095    |
| Re-timbering .....          | 7,170     | 4,751     | 11,922      | .020    |
| Back-filling .....          | 2,940     | 88        | 3,028       | .005    |
| Track-laying .....          | 13,722    | 6,854     | 20,576      | .034    |
| Tramming .....              | 205,074   | 9,901     | 214,975     | .357    |
| Pipefitting underground...  | 9,439     | 6,671     | 16,110      | .027    |
| Mine drainage .....         | 6,700     | 8,986     | 15,687      | .026    |
| Hoisting. ....              | 34,903    | 16,228    | 51,131      | .085    |
| Landing and dumping.....    | 24,526    | 890       | 25,417      | .042    |
| Drill repairs .....         | 5,864     | 40,167    | 46,031      | .076    |
| Sharpening steel .....      | 29,867    | 11,810    | 41,678      | .069    |
| Distributing steel .....    | 21,623    | 7         | 21,630      | .036    |
| Mine sampling .....         | 9,959     | 84        | 10,044      | .017    |
| Change house .....          | 2,738     | 1,582     | 4,321       | .007    |
| Mine lighting .....         | 770       | 8,524     | 9,294       | .015    |
| Assaying .....              | 1,916     | 952       | 2,868       | .005    |
| Surveying .....             | 9,329     | 1,869     | 11,199      | .019    |
|                             | \$804,083 | \$513,372 | \$1,317,455 | \$2.188 |

### SUPPLIES FOR NICKEL REFINERY.

The nickel refinery at Port Colborne now under construction is expected to be in operation before the end of the year. It will consume annually 100,000 tons of materials such as bituminous coal, coke, fuel oil, nitre cake and other chemicals. The output will be at the rate of 15,000,000 lb. nickel per year.

### HOLLINGER ORE RESERVES.

The following figures give a good idea of the character of the ore developed at the Hollinger. The estimate is as of December 31, 1916:

|                             | Tons.     | Value per Ton. |
|-----------------------------|-----------|----------------|
| No. 1 Vein .....            | 325,190   | \$11.19        |
| No. 2 Vein (North) .....    | 64,690    | 14.62          |
| No. 2 Vein (South) .....    | 97,070    | 7.64           |
| No. 3 Vein .....            | 18,000    | 5.10           |
| No. 4 and 50 Veins.....     | 613,140   | 8.25           |
| No. 5 Vein .....            | 32,540    | 10.00          |
| No. 7 Vein .....            | 17,000    | 10.47          |
| No. 8, 38 and 53 Veins..... | 637,890   | 7.60           |
| No. 10 Vein .....           | 25,400    | 7.35           |
| No. 13 Vein .....           | 37,000    | 5.54           |
| No. 14 Vein .....           | 162,080   | 8.81           |
| No. 15 Vein .....           | 65,010    | 10.19          |
| No. 16 Vein .....           | 7,040     | 7.40           |
| No. 26 Vein .....           | 24,860    | 9.33           |
| No. 37 Vein .....           | 20,750    | 8.45           |
| No. 41 Vein .....           | 317,730   | 7.32           |
| No. 44 Vein .....           | 8,000     | 20.00          |
| No. 51 Vein .....           | 14,600    | 6.36           |
| No. 52 and 52A Veins.....   | 86,460    | 10.09          |
| No. 54 Vein .....           | 122,260   | 7.21           |
| No. 55 Vein .....           | 47,570    | 13.13          |
| No. 56 Vein .....           | 88,210    | 6.07           |
| No. 58 Vein .....           | 276,000   | 8.96           |
| No. 59 Vein .....           | 57,970    | 10.84          |
| No. 65 Vein .....           | 49,300    | 12.47          |
| No. 74 Vein .....           | 14,000    | 4.21           |
| No. 79 Vein .....           | 17,730    | 5.52           |
| No. 83 Vein .....           | 24,780    | 5.79           |
| No. 84 Vein .....           | 99,120    | 7.01           |
| No. 85 Vein .....           | 217,540   | 7.75           |
| No. 88 Vein .....           | 2,970     | 14.74          |
| No. 200 Vein .....          | 3,300     | 18.77          |
| No. 204 Vein .....          | 5,920     | 6.40           |
| No. 206 Vein .....          | 7,360     | 6.95           |
| No. 207 Vein .....          | 42,000    | 6.00           |
| No. 226 Vein .....          | 12,180    | 30.37          |
| Surface. ....               | 275,880   | 9.80           |
|                             | 3,938,540 | \$8.68         |

Commenting on these estimates, Manager Robbins says:

"In estimating the reserves we use the actual measurements of the ore in place, but when the ore is mined, it is not possible to prevent a certain amount of waste rock from being broken and becoming intermingled with the ore. This dilution with waste has the effect of lowering the value per ton of the mixture, although it increases the number of tons. Our experience, after five years of operations, has been that there is a dilution of approximately 10 per cent., and hence the present estimate of 3,938,540 tons at \$8.68 per ton will when milled probably yield approximately 4,300,000 tons, averaging about \$7.75 per ton."

### A WAR "MOVE."

On account of Caxton House having been commandeered by the War Office, the address of the Institute of Metals will in future be 36 Victoria Street, London, S.W. The new offices are much more extensive and better suited to the purposes of a scientific society than those recently vacated.



## PRELIMINARY REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE CALENDAR YEAR 1916.

By J. S. McLeish, Mines Branch, Ottawa.

(Continued from last issue.)

### Gold.

The total production of gold in placer and mill bullion and in smelter production in 1916 is estimated at 926,963 fine ounces valued at \$19,162,025 as compared with 918,056 fine ounces valued at \$18,977,901 in 1915, an increase of \$184,124, or about 1 per cent. It is the largest production since 1902. The highest production recorded was \$27,908,153 in 1900, and the lowest since then was \$8,382,780 in 1907.

Of the total production in 1916 \$4,957,663 or 26 per cent. was derived from placer and alluvial mining; \$10,472,723, or 54 per cent. in bullion and refined gold, and \$3,731,639, or 20 per cent. contained in matte, blister copper, residues and ores exported.

The exports of goldbearing dust, nuggets, gold in ore, etc., in 1916 are reported by the Customs Department as \$18,382,903.

### Silver.

The production of silver in 1916 was 25,669,172 fine ounces valued at \$16,854,635 as against 26,625,960 fine ounces valued at \$13,228,842 in 1915, a decrease of 3.6 per cent. in quality, but an increase of 27 per cent. in value.

The exports of silver bullion and silver in ore, etc., as reported by the Customs Department were: 25,279,359 ounces valued at \$15,637,885, as against 27,672,481 ounces valued at \$13,812,038 in 1915.

The price of silver in New York which started in January with a minimum of 56¼ cents, increased quite regularly throughout the year, reaching a maximum of 76¾ cents in December. The average for the year was 65.661 cents, as against 49.684 cents in 1915.

### Copper.

The production of copper has shown large increases during the past three years. In 1916 the total copper contents of smelter products credited to Canadian ores and estimated recoveries from ores exported amounted to 119,770,814 pounds which would be worth \$32,580,057 at the average monthly price of refined copper in New York 27.202 cents per pound. The production in 1915 was 100,785,150 pounds, and at 17.275 cents per pound the average price for the year would be worth \$17,410,635. There was thus an increase in 1916 of 18,985,664 pounds, or 18.8 per cent. in quantity and \$15,169,422 or 87.1 per cent. in total value.

An electrolytic copper refinery which has been installed at Trail began active operations about Nov. 1 and has a capacity of 10 tons of refined copper per day.

Of the total 1916 production 92,763,603 pounds were contained in blister copper and in matte, and 27,007,211 pounds estimated as recovered from ores exported.

The New York price of electrolytic copper increased from a minimum of 22½ cents during the first week of the year to 29¼ cents in May, falling to 22½ cents again about the middle of July. From that the price increased steadily to 33½ cents during the first half of December closing the year at about 30 cents. The average monthly price was 27.202 cents as compared with an average of 17.275 cents in 1915, an increase of 9.927 cents or 57.5 per cent. Higher prices for copper have not been recorded since 1873 when the average for the year was 28 cents.

Exports of copper according to Customs records were: copper fine in ore, matte, regulus, etc., 124,942,

400 pounds valued at \$20,776,536; copper in pigs, bars, sheets, etc., 2,430,400 pounds valued at \$581,268. There were also exports of old and scrap copper amounting to 5,846,600 pounds valued at \$1,284,895.

The total value of the imports of copper in 1916 are recorded as \$7,565,377 as against \$3,957,770 in 1915. The imports in 1916 included 25,584,087 pounds of copper in pigs, ingots and manufactures valued at \$7,565,377; other manufactures of copper values at \$234,437 and copper sulphate \$1,803,655 pounds valued at \$198,542. There was also a considerable import of copper contained in brass.

### Lead.

Notwithstanding the demand and high prices, the actual recovery of lead as bullion and refined was less than during the previous year. The total production in 1916 of lead in bullion credited to Canadian mines and estimated as recoverable from ores exported was 41,593,680 pounds which at the average price of lead in Montreal 8.513 cents per pound, was valued at \$3,540,870. In 1915 the production was 46,316,450 pounds valued at \$2,593,721 (5.600 cents per pound). There was a decrease of over 10 per cent. in quantity, but an increase of over 32 per cent. in total value.

The 1916 production included 38,838,372 pounds of lead in bullion of which a large portion was electrolytically refined, and 2,755,308 pounds recoverable from ores exported. The lead bullion was produced chiefly at Trail with small contributions from smelters at Kingston and Galletta, Ont. The lead ores exported were derived from Notre Dame des Anges, Quebec, Hollandia mine, Bannockburn, Ont., Surprise Mine, Slocan, B.C., and the Silver King mine, Mayo, Yukon district.

### Nickel.

The production of nickel in 1916 has as usual been derived from the ores of the Sudbury district supplemented by the recovery of a small quantity of metallic nickel, nickel oxide and other nickel salts as by-products in the treatment of ores from the silver-cobalt-nickel ores of the Cobalt district.

The total production was 82,958,564 pounds which at 35 cents per pound would have a total value of \$29,035,497. The total production in 1915 was 68,308,657 pounds showing an increase in 1916 of 14,649,907 pounds, or 21.5 per cent.

The nickel-copper ore, derived from 9 separate mines in the Sudbury district supplemented by a small tonnage of similar ores from the Alexo mine in Timiskaming, is reduced in smelters and converters at Copper Cliff and Coniston to a Bessemer matte containing from 77 to 82 per cent. of the combined metals and shipped in that form to Great Britain and the United States for refining, the product of the Canadian Copper Company going to New Jersey and that of the Mond Nickel Company to Wales. A refinery is now under construction at Port Colborne, Ont., by the International Nickel Company, in which a portion of the matte produced by the Canadian Copper Company will be refined.

Although not shipping during the year the British America Nickel Corporation, Ltd., has been actively engaged in the development of its nickel properties in the Sudbury district and in the erection of a smelter.

The total production of matte in 1916 was 80,010 tons, containing 44,859,321 pounds of copper and 82,596,862 pounds of nickel. The tonnage of ore smelted (part being previously roasted) was 1,521,689



tons. The production in 1915 was 67,703 tons of matte containing 39,216,165 pounds of copper and 68,077,823 pounds of nickel.

Nickel was recovered as a by-product in smelters at Deloro, Thorold and Welland, from the silver-cobalt-nickel ores of the Cobalt district, the total nickel contents of nickel oxide, nickel sulphate and metallic nickel produced being 361,701 pounds. The products recovered included 79,360 pounds of metallic nickel; 323,418 pounds of nickel oxide and 232,450 pounds of nickel sulphate having a total reported value of \$132,896. The recovery from these ores in 1914 was 231,634 pounds of nickel.

The exports of nickel in ore matte or other form are reported by the Customs Department as 80,441,700 pounds valued at \$8,622,179 or an average of 10.77 cents per pound of which about 83 per cent. were exported to the United States.

The imports of nickel into the United States during 1916 which included small quantities from other sources as well as from Canada are recorded as 72,611,492 pounds contained in ore, matte, or other form valued at \$9,889,122 or an average of 13.62 cents per pound. The exports of nickel and nickel oxide, were 33,404,011 pounds valued at \$12,952,493 or an average of 38.775 cents per pound of which about 50 per cent. was consigned to Great Britain and 40 per cent. to France, Italy and Russia in Europe. The United Kingdom, it will be observed, has continued to receive through United States refineries a much larger quantity of nickel than is exported directly from Canada to Great Britain. The published records do not show the details "To other countries" for 1916 but a large portion of the 2,906,665 pounds thus exported went to Russia in Asia with smaller quantities to Norway, Sweden and Spain, etc. The value of the exports in 1916 ranged from 37.128 cents to 45.211 cents per pound. The average values of the exports in 1915 to

different countries ranged from 35.925 cents to 43.188 cents per pound, the total average being 38.338 cents per pound. The total average value in 1914 was 34.265 cents with a range of from 32.6 to 38.8 cents per pound.

The following table shows the production of nickel by smelters in the Sudbury districts, the exports from Canada and the United States records of imports and exports.

### Zinc.

With the exception of a small production in experimental work, there was no recovery of zinc spelter, or refined zinc in Canada previous to 1916. Hitherto the production of zinc has been recorded in terms of the tonnage of ore shipped and metal contents thereof. The establishment of an electrolytic refinery at Trail, and of zinc recovery plant at Shawinigan Falls, has placed the metallurgy of this metal in Canada on a similar basis to that of lead and copper and it will be in order to record the production accordingly.

In 1916 the total zinc ore shipments from mines including the zinc-lead ores from the Sullivan mine, and ores exported were about 80,965 tons, containing 47,243,575 pounds of zinc (partially estimated in the absence of complete returns). A portion of the ores shipped to Trail were not treated during the year and the percentage of zinc recovered at the Trail refinery in the early stages of operation was probably not as large as will be secured when primary difficulties have been eliminated. Adding to the actual recovery of refined zinc at Trail 80 per cent. of the zinc contents of ores sent to the United States smelters, we have a zinc production of 23,515,030 pounds, which at the average price of zinc for the year 12.804 cents would be worth \$3,010,864. Of the total production thus recorded, 1,774,080 pounds is credited to the Notre Dame des Anges ores in Quebec, and 21,740,950 pounds to British Columbia.

| Production of Nickel in Canada.       |             | 1912.       | 1913.       | 1914.        | 1915.      | 1916.  |
|---------------------------------------|-------------|-------------|-------------|--------------|------------|--------|
|                                       | Tons.*      | Tons.*      | Tons.*      | Tons.*       | Tons.*     | Tons.* |
| Ore mined .....                       | 737,584     | 784,697     | 1,000,364   | 1,364,048    | 1,566,333  |        |
| Ore smelted .....                     | 725,065     | 823,403     | 947,053     | 1,272,283    | 1,521,689  |        |
| Bessemer matte produced .....         | 41,925      | 47,150      | 46,396      | 67,703       | 80,010     |        |
| Copper content of matte .....         | 11,116      | 12,938      | 14,448      | 19,608       | 22,450     |        |
| Nickel content of matte .....         | 22,421      | 24,838      | 22,759      | 34,039       | 41,298     |        |
| Spot value of matte .....             | \$6,303,102 | \$7,076,945 | \$7,189,031 | \$10,352,344 | .....      |        |
| Exports of Nickel from Canada.        |             | 1912.       | 1913.       | 1914.        | 1915.      | 1916.  |
|                                       | Lbs.        | Lbs.        | Lbs.        | Lbs.         | Lbs.       | Lbs.   |
| Nickel contained in matte, etc.—      |             |             |             |              |            |        |
| Exported to Great Britain .....       | 5,072,867   | 5,164,512   | 10,291,979  | 13,748,000   | 11,136,900 |        |
| Exported to United States .....       | 39,148,993  | 44,224,119  | 36,015,642  | 52,662,400   | 69,304,800 |        |
| Exported to Other Countries .....     | .....       | 70,386      | 220,706     | .....        | .....      |        |
|                                       | 44,221,860  | 49,459,017  | 46,538,327  | 66,410,400   | 80,441,700 |        |
| Imports of Nickel into United States. |             | 1912.       | 1913.       | 1914.        | 1915.      | 1916.  |
|                                       | Lbs.        | Lbs.        | Lbs.        | Lbs.         | Lbs.       | Lbs.   |
| Gross tons of ore and matte.....      | 33,101      | 37,623      | 29,564      | 45,798       | 59,741     |        |
| Nickel contents .....                 | 42,168,769  | 47,194,101  | 35,006,700  | 56,352,582   | 72,611,492 |        |
| Exports of Nickel from United States. |             | 1912.       | 1913.       | 1914.        | 1915.      | 1916.  |
|                                       | Lbs.        | Lbs.        | Lbs.        | Lbs.         | Lbs.       | Lbs.   |
| To France .....                       | 5,083,947   | 3,631,858   | 3,457,157   | 3,018,354    | 2,823,132  |        |
| To Italy .....                        | .....       | .....       | .....       | .....        | 2,715,521  |        |
| To Netherlands .....                  | 7,387,447   | 6,622,811   | 855,168     | 129,557      | 516,331    |        |
| To Russia in Europe .....             | .....       | .....       | .....       | .....        | 7,767,875  |        |
| To United Kingdom .....               | 8,191,364   | 8,221,640   | 10,836,369  | 14,801,565   | 16,674,487 |        |
| To Other Countries .....              | 5,152,258   | 10,096,779  | 12,446,458  | 8,469,074    | 2,906,665  |        |
| Total. ....                           | 25,815,016  | 29,173,088  | 27,595,152  | 26,418,550   | 33,404,011 |        |

\* In tons of 2,000 lbs.

### Cobalt.

Cobalt is being recovered at the smelters at Deloro, Thorold and Welland, Ontario, in the form of metallic cobalt, cobalt oxide, cobalt sulphate and other salts and also stellite the cobalt alloy used for high speed tool metal, from silver-cobalt-nickel ores of the Cobalt district. Some cobalt residues from the Nipissing mill have also been shipped to Great Britain.

The total production of cobalt contained in smelter products recovered and in cobalt residues exported during 1916 is estimated at 841,859 pounds valued at \$926,045. In 1915 the production was equivalent to 504,212 pounds of cobalt valued at \$536,268.

The 1916 production included 215,215 pounds of metallic cobalt; 670,760 pounds of cobalt oxide together with smaller quantities of cobalt sulphate, cobalt carbonate, cobalt hydroxide, unseparated oxides, stellite and cobalt residues.

### Molybdenum.

The demand for molybdenite has resulted in considerable exploration of known occurrences and the development of several properties of considerable promise. Shipments were made during 1916 from at least 17 different localities in Quebec, Ontario and British Columbia, of which that at Quyon operated by the Canadian Wood Molybdenite Company is probably the most important. Most of the ores produced were shipped for concentration to the International Molybdenum Company's mill at Renfrew, or the concentrating plant operated by the Mines Department at Ottawa. Some ores were also shipped by the Canadian Wood Molybdenite Company for concentration in Denver, this company has also built a mill near the mine at Quyon and a second mill at Hull, Que. A concentrating mill has also been built by the Renfrew Molybdenum Mines Company at Mt. St. Patrick.

The total  $\text{MoS}_2$  contents of concentrates produced and shipped during the year was about 159,000 pounds for which approximately \$1.00 per pound has been paid the official price being 105 shillings per unit of  $\text{MoS}_2$  at Liverpool.

A portion of the concentrates have been used in the manufacture of molybdic acid, and ferro-molybdenum at Orillia, Ont. Ferro-molybdenum is also now being made at Belleville, Ont. The Imperial Munitions Board, Ottawa, is an agent for the purchase in Canada of molybdenum for the British Government.

### Iron Ore.

Mining operations have been confined to the Helen and Magpie mines of the Algoma Steel Corporation in the Michipicoten district of Ontario, together with a small production of ilmenite at Ivry-on-the-Lake, Quebec by the Manitou Iron Mining Company. There was also a shipment of concentrates from the concentrator at Trenton, Ont., produced in previous years from ores derived from the Bessemer and Childs mines in Hastings county.

Shipments of iron ore from Wabana mines, Newfoundland, in 1916 by the two Canadian companies operating there were 1,012,060 short tons, all of which was shipped to Cape Breton.

### Asbestos.

The Asbestos industry has been particularly active during 1916, the value of the production having been the highest on record though the quantity was slightly exceeded in 1913. Stocks on hand at the end of the year were reduced to a minimum. Production, as

usual, has been confined to the asbestos district of Black Lake, Thetford, Robertsonville, Danville, and East Broughton, in the Eastern Townships, Province of Quebec.

### Chromite.

The total shipments of crude chromite ores in 1916 were 27,030 tons, valued at \$299,753. These ores contained a total of approximately 6,574 tons of  $\text{Cr}_2\text{O}_3$  or an average of about 24 per cent. A considerable portion of the low grade ore and sand, however, amounting to 14,242 tons, was sent to concentrating mills for concentration before being marketed. The quantity thus concentrated was 10,992 tons from which were recovered 1,046 tons of concentrates, averaging from 42 per cent. to over 50 per cent. of  $\text{Cr}_2\text{O}_3$ . The final shipment of ore and concentrates would approximate 13,834 tons.

The exports of chromite are reported by the Customs Department as 12,633 tons, valued at \$152,534.

Production in 1915 was reported as 12,341 tons, valued at \$179,540, with exports of 7,290, valued at \$81,838.

Practically the entire production has been obtained in the district tributary to Thetford and Black Lake; in the Eastern Townships, Quebec.

### Feldspar.

Feldspar was derived from the same districts as in previous years, viz.: Frontenac County, Ontario, and Hull and Villeneuve townships, Quebec. Shipments in 1916, which were the highest recorded amounted to a total of 19,166 tons, valued at \$71,357, or an average of \$3.72 per ton, and included 14,878 tons, valued at \$53,332 from Ontario and 4,288 tons, valued at \$18,025 from Quebec.

### Fluorspar.

Shipments of fluorspar were made from Madoc, Ontario, during 1916 amounting to 1,284 tons, valued at \$10,238. This was practically the first commercial operation of these deposits.

Imports of fluorspar are not shown separately in the Customs records but there is an annual consumption in steel furnaces of from 10,000 to 15,000 tons.

### Graphite.

The total shipments of milled and refined graphite were 3,971 tons, valued at \$285,362, or an average of \$71.86 per ton, and included 495 tons, valued at \$35,776 from Quebec, and 3,476 tons, valued at \$249,586 from Ontario.

The production includes material varying in value from \$54 to \$270 per ton.

The production in 1915 was 2,635 tons, valued at \$124,223.

### Gypsum.

The total quantity of gypsum rock quarried in 1916, was 422,741 tons, of which 92,864 tons were calcined. The shipments of gypsum of all grades totalled 341,618 tons, valued at \$730,831, and included lump, 249,759 tons, crushed 15,680 tons, fine ground 6,057 tons, and calcined 70,122 tons.

### Magnesite.

Magnesite was quarried and shipped chiefly from Grenville township, Argenteuil county, Quebec, supplemented by several hundred tons from Atlin district in British Columbia.

The total shipments in 1916 were 55,413 tons, valued at \$563,829, or an average of \$10.17 per ton.



### Natural Gas

The total production of natural gas according to returns received, was 25,238,568 thousand cubic feet, valued at \$3,924,632, as compared with a production in 1915 of 20,124,162 thousand cubic feet, valued at \$3,706,035. The production by provinces was as follows: Ontario 17,838,318 thousand cubic feet, valued at \$2,730,653; New Brunswick 610,118 thousand cubic feet, valued at \$79,628, and Alberta 6,818,131 thousand cubic feet, valued at \$1,114,351.

### Petroleum.

There has been comparatively little change in the production of petroleum during the past three years, although since 1907 there has been a distinct falling off. A bounty of  $1\frac{1}{2}$  cents per gallon is paid on the marketed production of crude oil from Canadian oil fields through the Department of Trade and Commerce. From the bounty statistics it appears that the 1916 production in Ontario and New Brunswick was 198,123 barrels on which bounties amounting to \$104,014.13 were paid. The market value of the crude oil at \$1.97 11-12 per barrel amounted to \$392,284. In Alberta there was a small production of crude oil, but no bounty was paid on this as the specific gravity was below the standard set by the Petroleum Bounty Act and complete records have not as yet been received from the producers.

### Pyrites.

The production of pyrites in 1916 was 309,411 tons, valued at \$1,084,019 and included 130,799 tons, valued at \$523,196 from Quebec, 177,552 tons, valued at \$555,523 from Ontario, and 1,060 tons, valued at \$5,300 from British Columbia. In 1915 the total production was 286,038 tons, valued at \$985,190, which included 142,735 tons, valued at \$570,940 from Quebec, and 143,303 tons, valued at \$414,250 from Ontario.

### Salt.

The Canadian salt production is obtained from southern Ontario. The total sales in 1916 were 124,033 tons, valued at \$668,627 (exclusive of the cost of packages). The 1915 sales were 119,900 tons, valued at \$600,226.

In addition to the production of salt, brine is pumped for use in chemical works at Sandwich, Ontario, where caustic soda and bleaching powder are manufactured by the Canadian Salt Co.

### GEOLOGY OF KINGSTON AND VICINITY.

The Ontario Bureau of Mines has published a report by M. B. Baker, on the geology of Kingston and vicinity: A section of the report dealing with the Paleozoic strata was prepared by E. M. Kindle. A synopsis of the common fossils of the Kingston area, prepared by Alice E. Wilson and Kirtley F. Mather, is appended.

The report will be especially interesting to students of geology. The area covered has produced a great variety of minerals. Feldspar and mica are the minerals of chief economic importance.

### EXPLORATION IN SUDBURY DISTRICT.

Exploration of nickel-copper properties in the Sudbury district will be carried on vigorously this year. Diamond drilling campaigns now under way and planned will keep several drills busy this year.

### CANADIAN MINING INSTITUTE—Western Branch.

The twenty-fourth general meeting of the Western Branch of the Canadian Mining Institute was held in Vancouver, British Columbia, on March 15 and 16. In the unavoidable absence of the chairman of the branch for the current year, Mr. Bruce White, manager for the Noonday Mines, Ltd., Sandon, Sloean, B.C., the chair was filled by Mr. Robert R. Hedley, M. E., of Vancouver, who, the branch secretary (Mr. E. Jacobs, of Victoria) informed the meeting, is one of the oldest members of the Institute resident in British Columbia, his membership dating from 1898.

### Afternoon Session.

There was a comparatively large and influential attendance at the opening session, held in the Vancouver Board of Trade's hall on Thursday afternoon, March 15, there having been fully 100 present, including several ladies.

On behalf of the city of Vancouver, and in Mayor McBeath's absence, Alderman Kirk spoke briefly in welcoming the members of the institute to the city. He said that British Columbia's mineral output had increased from \$29,500,000 in 1914 to \$43,000,000 in 1916, and would undoubtedly continue to increase at a rapid rate.

President Greer of the Vancouver Board of Trade welcomed the members of the Institute to the city, and stated that the interests of the two bodies were the same, the general development of the interests of British Columbia. "We have a special mining committee," said Mr. Greer, "and we have also what is known as a Chamber of Mines. You may rest assured that you will have the continued co-operation of the Vancouver Board of Trade. We look to you for advice and assistance, knowing that your findings go a long way toward the development of mining in this province."

The chairman briefly acknowledged the courtesy and kindness of the representatives of the city and Board of Trade, respectively, and reciprocated their good wishes.

### Cottrell Process of Dust Precipitation.

Professor J. G. Davidson, of the University of British Columbia, having been invited by the chairman to address the meeting, spoke briefly concerning the Cottrell process of electric precipitation of smelter dust and fumes. He told how, by modern methods, the value which formerly was lost in the form of dust and gases, can now be saved, and that this value in many cases amounts to eight or nine per cent. of the ore recovery. The greatest development in the larger smelters has been in providing facilities for such recovery and he cited what has been done in the great smelters of the United States. He also explained the process of treating mercuric ores the metal of which is the most volatile of any known metal, and until recently considered the hardest to control. By modern methods of precipitation, nearly an absolute recovery of the quick-silver content of ores can be made.

### "Notes on an Iron and Steel Industry."

Mr. R. R. Hedley spoke on the iron and steel industry. In this connection he said that practically there is no such industry in British Columbia, since the firms which are engaged in manufacturing iron and steel articles depend almost exclusively on scrap iron for their supply.

It has been stated that coal in British Columbia is too costly to be converted into coke; that there are no hematite iron ores available; that labor cannot be



obtained; that power is not to be had. All of these statements are rank pessimism.

As to a market for the product, provided it were produced, this is small at present, but can be extended when industries are established. Following the cessation of the war, there will be for a time a shortage of tonnage to handle all products; but Australia, Japan and New Zealand are building ships, England has never ceased, and now British Columbia is getting into the game. One year after the close of the war, he predicted that there will be plenty of ships on the Pacific to take British Columbia iron wherever it is needed. In the meantime the province should prepare for the vast wave of opportunity which is even now forming.

As to the coke situation he firmly believed that there are certain seams of coal in the Vancouver Island series which will produce a superior quality of metallurgical coke. For this purpose the fine coal is used, and coke can be made at a cost not to exceed \$6 per ton, and if the by-products of the coal are saved, this cost can be cut down by \$2 or \$2.50.

Undoubtedly, local conditions as to labor are adverse, but by judicious management and using efficiency in all departments, this handicap can be overcome.

On the coast the ores are principally magnetite, the hematite ores occurring in the interior. Magnetite is not considered by many to be a desirable iron ore, although it is used successfully in Norway and Sweden. Mixed with hematite on an equal basis, it is easily treated, and processes are now being perfected whereby it may become the most valuable of the iron ores. The sulphur contents may not be a detriment as in the past.

There are many known deposits of magnetite ore along the coast which are very high in their iron contents, and low in both sulphur and phosphorus. It is easy in British Columbia to obtain ores which run 60 per cent. iron, and which contain as well other values. He shipped, three years from Tassoo harbor, 1,100 pounds of magnetite ore to the Tacoma smelter which carried 62 per cent. iron, 1.8 per cent. copper, \$40 gold, and .4 of an ounce in silver. A little copper in the iron is not a detriment.

He was satisfied that there are large bodies of both magnetite and hematite ores in the province available, as well as lime, and coal for coking purposes.

So far as blast furnaces are concerned, their success will depend on the cheapness of available power, but there is a plethora of water power in this province which has not been developed.

He figured that it costs more in Pittsburg, where efficiency has been brought down to the "nth" stage, to produce a ton of pig iron than it would cost in British Columbia today if a plant were started.

#### Manufacture of Pig Iron.

Following Mr. Hedley's address, an interesting paper, contributed by Mr. M. W. Garman, of Nanaimo, was read. The two papers were discussed together, those taking part being Messrs. Nicol Thompson, E. A. Haggen, R. C. Campbell-Johnson, Professor Davidson, and others. Professor Davidson dealt with the question of producing coking coal and charcoal and in connection with the matter of government assistance to help the mining industry, he stated that representations should be made that would have the effect of placing the industry on a paying basis and he was certain that that assistance would be given.

#### New Pulmotor Explained.

Mr. H. H. Sanderson, mine safety engineer, of Seattle, Wash., demonstrated the use of the new "B" type pulmotor which weighs only 12½ pounds, and the oper-

ation of which is entirely in the hands of the man who stands at the victim's face, giving greater efficiency than can be obtained by the old style machines, which weigh 58 pounds. The new device is simple in operation, and can be carried on the run by anyone who is in a hurry to arrive at the scene of an accident. Incidentally he mentioned that a pulmotor was recently used in Fernie with success upon a man who had been overcome with ammonia fumes.

#### Short Course in Mining.

At the request of the chairman, a statement was made by Prof. J. M. Turnbull of the British Columbia University, regarding the number of students who had attended the lectures on mineralogy that had been given during the winter. They had on their roll at the lectures twenty-eight students and it was their intention to extend that series and to have the lectures given in various centres throughout the province.

#### Five Years' Progress in Metallurgy.

The secretary read a paper on "Five Years' Progress in Metallurgy," prepared by Prof. F. A. Thomson, head of the department of mining engineering at the State College of Washington, Pullman, Washington, which was prepared for the Northwest Mining Convention, held in Spokane, Washington, in February. In this Professor Thomson dealt with flotation concentration, methods of ore treatment, electrolytic process, ore dressing and copper metallurgy, which he concluded with a general resume of the advance in the methods of ore treatment in the last five years.

In summarizing, he stated: "It has been found that momentous progress has been made in the field of ore dressing through the development of flotation in zinc ore treatment by leaching and electrolysis, in the leaching of copper ores and in the improvement of copper smelting practice. The significant feature of the progress is that practically all has occurred west of the Rocky Mountains and under the direction of American and Canadian engineers and metallurgists."

Before adjournment until evening, the secretary mentioned the recent death of the late Mr. Wm. Blackmore, of Victoria, a charter member of the Institute. He also asked for a resolution of remembrance to be sent to members of the Institute on active service, among whom there were about thirty members of the Western Branch. The following resolution was afterward prepared by Messrs. C. A. Cartwright and A. G. Langley, and unanimously adopted:

"That those present at this meeting send cordial greeting to, and express their deep appreciation of, the splendid services of those members of the Canadian Mining Institute who are now serving their country and her allies. May they be spared to participate in a glorious peace with victory, and that at an early date."

#### Thursday Evening Session.

There was also a large attendance at the evening session, which was opened by Mr. Geo. Ritchie, of the Taylor Engineering Co., giving a description of a cement gun, emphasizing its effectiveness for certain work underground in mines, especially in coal mines.

Dr. E. T. Hodge, professor of geology and mining at the University of British Columbia, gave an address, in which he dealt with the future of the iron industry in British Columbia, and urging the need for a fuller determination of the extent of the iron-ore resources of the province before the expenditure of much capital on iron smelting and auxiliary works.

#### Technical Education in the High Schools.

Mr. John Kyle, provincial organizer of technical



education, spoke on "The Necessity of Technical Education in the High Schools in the Mining Districts." He drew attention to the fact that many boys and girls left school in the intermediate grade and became what he described as vocational hoboes. The purpose of the technical schools was to fit them for work in after-life, for the vocation that they would take up. He deprecated the practice of having the same curriculum in urban and rural districts, and said that unless theory and practice were brought into juxtaposition all the teaching would be in vain.

Dealing with the work that had already been done along these lines a number of views were shown giving a clear idea of the advance that has already been made in the technical education movement in this province. He urged the men to take a deeper interest in the work of the different school boards to become acquainted with what the boys and girls were learning every day, and mentioned that the government was willing to give dollar for dollar for technical equipment and 75 per cent. of the value of manual training equipment to teach boys how to work with their hands.

#### **Progress of Copper Mining Industry.**

A number of lantern slides were shown, to illustrate the progress that had been made in copper mining and metallurgy in the Coast district of British Columbia. These comprised views of the Granby Consolidated Co.'s Hidden Creek mine, and its big smelting works at Anyox, on Observatory inlet, and of the Britannia Co.'s mine and concentrating mills, near Howe sound, Vancouver mining division. The secretary gave brief particulars of the various scenes depicted.

#### **First-Aid and Mine-Rescue Views.**

In the unavoidable absence of the Chief Inspector of Mines, Mr. Thos. Graham, and of his assistant, Mr. Dudley Michel, the subjects of First-Aid and Mine-Rescue work had to be passed without the intended notice of them. The secretary gave information relative to numerous lantern-slide views of First-Aid and Mine-Rescue contests at coal and metal mines in the province, teams of competitors, training stations, ambulance cars, etc., and also showed several pictures of the U. S. Bureau of Mines' Mine-Rescue motor truck recently added to the equipment of the Mine-Rescue station on the campus of the University of Washington, Seattle, Washington.

#### **Tacoma Smelting Works.**

A lengthy and most interesting account of the smelting works at Tacoma, Puget Sound, Washington, to which reduction works has for years been shipped much of the copper ore produced in the Coast district of British Columbia, southern Yukon, and Alaska, was given by Mr. Dale W. Pitt of the company's staff. This was especially welcomed, since little information relative to the Tacoma smelting works had previously been made public in British Columbia.

#### **Friday Evening Session.**

As it had not been practicable to complete the program on Thursday evening, another session was held on Friday evening, and at this there was also a good attendance.

Two papers were read by the secretary. One was by Mr. W. M. Brewer on "Lode-Mining on Vancouver Island," and the other by Mr. John D. Galloway, assistant mineralogist for British Columbia, on "Notes on the Copper Deposits of the Northern Interior of British Columbia." These were discussed, and the consideration of the papers on an iron industry was resumed.

## **PERSONAL AND GENERAL**

Mr. H. H. Howard, formerly on the staff of the Mining Corporation of Canada, has been appointed engineer for Colosus Gold Mines, Ltd., which company has been recently formed to develop property in Munro township, near the Croesus mine.

Smith and Durkee, of Sudbury, are resuming drilling at the Flin Flon properties, Manitoba, for Mr. Jack Hammel and associates.

Mussens, Ltd., of Montreal, have removed from 318 St. James Street, and are now occupying their new offices on the second floor of the McGill Building, 211 McGill Street, Montreal.

Mr. M. B. Myers, formerly assistant to the vice-president of the American Manganese Steel Co., has been appointed to the office of sales manager.

Mr. W. J. Elmendorf, for several years operating in Portland Canal mining division of British Columbia, but now having his headquarters in Seattle, Washington, has been examining mining property on the West Coast of Vancouver Island.

Mr. C. F. Caldwell, of Kaslo, B.C., who for some time past has been actively engaged in mining in Ainsworth mining division, left British Columbia on March 6th to visit St. Paul and Chicago.

Mr. W. G. Norrie, superintendent of the Silver Standard mine, near Hazelton, Omineca division of British Columbia, was in Seattle, Washington, and Vancouver, B.C., last month, in connection with the purchase of mining machinery for the further equipment of the Silver Standard mine, which last year shipped 651 tons of silver-lead ore to Trail, B.C., and 209 tons of silver-zinc ore to the United States.

Mr. Wm. Thomlinson will shortly return to New Denver, B.C., his duties in connection with the exhibition of minerals at San Diego, California, by the Canadian Exhibition Commission, ending with the closing of the Pacific-California Exposition at the end of March.

Mr. O. B. Smith, superintendent of mines for the Granby Consolidated M. S. and P. Co., returned to the company's offices in Vancouver, B.C., about the middle of March after having spent a vacation in Southern California.

Mr. W. J. Watson, formerly manager for the Tyee Copper Co., will remain at Ladysmith, Vancouver island, B.C., for a while, acting in a consulting capacity for the new owners of the Tyee smelter at that place.

Mr. W. E. Zwicky, manager of the Cork-Province silver-lead-zinc mines on the south fork of Kaslo river, Ainsworth division of British Columbia, went to Spokane, Washington, last month in connection with an endeavor to obtain more capital for the operation of the Cork mines and concentrating plant.

Mr. S. S. Fowler, general manager for the New Canadian Metal Co., operating the Bluebell lead-silver mine and concentrator at Riondel, Kootenay Lake, B.C., has gone to San Diego, California, for a few weeks' much-needed rest and change of climate.

Mr. A. C. Garde, formerly actively associated with silver-lead and zinc mining and milling in Slokan district of British Columbia, but of late years giving attention to the development of mining properties in the Northern Interior of the province, is now advocating the establishment of smelting works at Prince Rupert, the western terminal of the Grand Trunk Pacific railway.



## SPECIAL CORRESPONDENCE

### COBALT AND PORCUPINE.

#### Mining Corporation's New Plant.

The big high grade plant of the Mining Corporation of Canada (Cobalt Reduction Co.), at Cobalt, is running smoothly, and from early this month the concentrates will be treated in the new mill with the high grade ores from the mines of the company. All future shipments will be in the form of bullion and will be shipped to London. The new plant differs somewhat from that of the two other high grade plants in the camp in that amalgamation plays no part in the process. The ore is first slimed in a tube mill and after passing through two stages is dewatered and washed on an Oliver filter, then given a cyanide treatment and again filtered on a second Oliver. The silver is precipitated from the solution by means of a sodium sulphide. The silver sulphide is de-sulphurized by aluminum and refined in reverberatory furnaces to a high grade bullion which is cast into bars ready for shipment.

#### Sinking on Black Claim.

A contract has been let to sink the shaft on the Black Claim at Kirkland Lake from the 50 ft. to the 100 ft. level, and work is now under way. The Black Claim was recently optioned by Mr. Frank L. Cohen and associates of Buffalo. Should the work at present going on prove satisfactory it is understood that a small electrically driven plant will be installed early in the summer and further work done.

#### Schumacher.

Upwards of one thousand feet of diamond drilling was done during the month of February on the Schumacher property at Porcupine which compares with an average of between six and seven hundred feet per month for the past six months. All this work has been very favorable and a number of important ore-bodies and veins have been discovered. Working at the 200-ft. level of the No. 4 shaft a diamond drill encountered a vein which proved to be seventeen feet in width, while on the surface the same vein had a width of sixteen feet. This vein has also been cut about 75 ft. west of this working and was found to be eleven feet in width. This block of ore which has been definitely proven in the mine adds approximately eighty thousand tons to the company's reserves. Schumacher ore runs around six dollars per ton, therefore the new orebody will add materially to the proven intrinsic value of the mine.

#### La Rose.

According to the information received here last week it is understood the La Rose Mining Company, which had an option on the Maidens-McDonald claims in Deloro township, is not going to exercise their option on this property.

#### Tough-Oakes.

The Tough-Oakes Mining Company's report for the year ending Dec. 31st, 1916, shows the company to have mined 39,863 tons of ore from which was extracted \$707,114. Ore averaged \$17.85 per ton; milling costs, \$2.43, and mining costs, \$4 per ton; net profit was \$260,668. Development for the year consisted of 9,437 ft. and was confined chiefly to veins Nos. 2, 3, and 6. Experimental work on the flotation process so far has not resulted in anything definite being determined upon, but work will be continued with the hope of finding a process which will result in a material

reduction of the costs of treatment. The Charlton Power Company from which the Tough-Oakes obtained its power supply has closed down and the company is now using entirely electric power recently made available in the Kirkland Lake district by the Northern Ontario Light and Power Company, and will have sufficient power for all the future requirements of the mine.

#### Wright Porcupine Mines.

The Wright-Fernerer-Williamson claims in Deloro township, about two miles south from the Tisdale line, have been purchased and will be operated by a company known as the Wright Porcupine Mines, Ltd. A number of promising veins have been uncovered on the eighty acres of ground owned by the company. Camp buildings have been erected and an up-to-date plant installed. The main shaft has reached a depth of ninety ft., and the vein which was thirty ft. wide on the surface has widened out to thirty-five ft. at this depth. The shaft will be continued to the 300 ft. level and will be a two compartment shaft. At the three hundred ft. level lateral work will be carried on, and it is also the intention of the company to explore their property at every hundred ft. level.

#### Increasing Power Plant.

The Northern Ontario Power Company is increasing the capacity of its power plant at Wawaitin Falls. The present capacity of the plant is something like 8,000 h.p., and the company is now working on the installation of a 2,500 h.p. unit, which will be followed by another of the same size within the next few months.

A dam is to be built across the Red Sucker river at a point a short distance below the mouth of Cripple creek, to divert these two streams into the Matagami, which will greatly increase the volume of water flowing over the company's turbines at Wawaitin.

#### Porcupine Crown.

The work of installing the plant on the Hennessey claims in Deloro township, about three and a half miles from Timmins will be commenced shortly. These claims are under option to the Porcupine Crown Mining Company at a large figure, and the work of erecting camp buildings of all kinds is now about completed. The Hennessey is located on the contact between a rusty schist and Keewatin greenstones, which runs northeast through Deloro township and is situated less than a mile from the Hayden mines. Satisfactory results are being encountered at the 300-ft. level of the Hayden mines.

#### Gold Reef.

The Porcupine Gold Reef is working at the present time on a narrow but very rich vein, and stoping is now being carried on about fifty feet from the surface and one hundred ft. of lateral work has also been done on the property. The work is being done by the rather slow process of hand drilling. The management expects to ship a small amount of ore about May 1st.

#### Murray-Mowgridge.

About sixteen men are engaged at the Murray-Mowgridge, situated at Wolfe lake, about three miles from Bourkes' siding, and the machinery for the plant is expected to arrive any day now. Comfortable camp buildings have been built for the men and also office quarters for the office staff. Development work has been going on in the south shaft during the winter, and it is reported that very favorable results have been obtained.



### North Dome.

It is reported here that the Dome Mines are negotiating for an option on the North Dome. The North Dome is situated immediately north of the Dome extension, on which the Dome Mines now hold an option, and the property consists of one hundred and twenty acres. Some very spectacular discoveries of gold were made on the North Dome in 1911-1912. Should the Dome Mines acquire this property and the Dome Extension, they would have an area of five hundred and sixty acres.

### Discovery on McKinnon Claims.

Mining operations have been going on quietly for some time on the McKinnon-Ogilvie claims in the north-east corner of Pacaud township, in the Boston Creek district, and it was announced last week that a rich discovery of gold had been made. This property is situated a little north of the Miller Independence, which has been operating very successfully for some time.

### Trethewey.

The Trethewey Mining Company, of Cobalt, has installed the Groch flotation system in the mill here and it is understood to be working satisfactorily. A Groch machine is also being used at the Coniagas Mine and is proving very successful.

### Wright-Hargraves.

An 8 x 10 hoist was shipped from here to the Wright-Hargraves at Kirkland lake last week, and will be installed at the No. 3 shaft, where it is the intention of the management to sink to the 300 ft. level. Already 108 ft. of sinking has been accomplished at this point. The No. 2 shaft is now down to the 100-ft. level where a station will be cut. It is intended to sink this shaft to the 300-ft. level also, and when this depth is reached a drift will be run to connect up the two shafts a distance of 900 feet. Both these shafts are being sunk on the same vein, which is said to be traceable on the surface for nearly three thousand feet.

### Staking in Cairo and Powell.

Private interests are said to be looking into the power possibilities of the Cairo and Powell mining field, about eighteen miles up the Montreal river from Elk lake, where considerable staking was done last fall and this winter. It is expected that the coming of spring will see quite a lot of activity in this district. The veins are very wide, and some have been proven to contain gold in encouraging quantities. Five hundred and seventy-five claims have already been recorded in this neighborhood.

### Claims Optioned.

The Skyjousby claims, which were the original gold discovery east of Bourkes' siding, have been optioned to a number of Toronto men and preparations for their development are said to be under way at present. The claims are situated about three miles east of the station and are quite close to the famous Wickstead claims, which were purchased by Mr. N. E. Malouf, for a large sum.

### McCrea Claims Sold.

The first payment on the purchase of the McCrea property at Boston Creek, was made in Haileybury on Saturday, when the sum of \$3,000 was paid by Messrs. McKinnon and Ogilvie of Montreal for these claims. The total purchase price has not been announced but it is said to be a large one. This claim was at one time under option to the Crown Reserve

Mining Company, and a small amount of exploring work was done, including the sinking of a shaft to the depth of about eighty feet. However, the vein was found to have a dip towards the Renand claims adjoining on the north, and this was supposed to be the reason for the Crown Reserve dropping their option. Messrs. McKinnon and Ogilvie purchased the Renand claims and developments on this property have proven so satisfactory that it was thought advisable to purchase the McCrea claims also. High grade ore is said to have been found in considerable quantities on the Renand claims.

### \$10,000,000 ANNUALLY FOR WAGES AND SUPPLIES.

According to the Ontario Nickel Commission it takes \$10,000,000 to pay the wages and provide the supplies for the Sudbury nickel mines for twelve months.

The public accounts placed before the Legislature of British Columbia at its opening on March 1 included the following receipts from the mining industry of the Province for the last fiscal year:

|                                                    |              |
|----------------------------------------------------|--------------|
| From Free miner's certificates . . . .             | \$ 47,920 80 |
| Mining receipts, general . . . .                   | 59,277 85    |
| Mineral tax . . . . .                              | 163,335 58   |
| Tax on unworked Crown-granted mineral claims . . . | 35,703 23    |
| Bureau of Mines . . . . .                          | 884 25       |
| Royalty and tax on coal . . . .                    | 173,261 75   |

\$480,383 46

In addition there are various sources of revenue not segregated, so it appears a reasonable estimate to place the year's total revenue from the mining industry of the Province at a sum in excess of \$500,000.

### NICKEL REFINERY AT MURRAY MINE.

At the British-America Nickel Corporation's refinery the Hybinette electrolytic process will be used. The plant planned will have a capacity of 5,000 tons per year. The refinery will probably be erected at Murray Mine.

### GOLD IN TEMAGAMI RESERVE.

The Golden Rose property, near Emerald Lake, in the Temagami Forest reserve, will be explored this year. Gold occurs in flat quartz veins in the iron formation.

### SILVER PRICES.

|                       |  | New York.<br>cents. | London.<br>pence. |
|-----------------------|--|---------------------|-------------------|
| February 24 . . . . . |  | 77 3/8              | 37 3/4            |
| " 26 . . . . .        |  | 77 1/8              | 37 1/2            |
| March 6 . . . . .     |  | 76 3/8              | 37 3/8            |
| " 7 . . . . .         |  | 75 1/2              | 37 1/8            |
| " 8 . . . . .         |  | 75 3/8              | 37 1/8            |
| " 9 . . . . .         |  | 75 3/8              | 37 1/8            |
| " 10 . . . . .        |  | 75 1/2              | 37 1/8            |
| " 12 . . . . .        |  | 75                  | 36 3/4            |
| " 13 . . . . .        |  | 74 1/4              | 36 1/2            |
| " 14 . . . . .        |  | 73 1/4              | 36                |
| " 15 . . . . .        |  | 73                  | 35 3/8            |
| " 16 . . . . .        |  | 73                  | 35 3/8            |
| " 17 . . . . .        |  | 73                  | 35 1/8            |
| " 19 . . . . .        |  | 72 3/8              | 36 3/8            |
| " 20 . . . . .        |  | 72 3/8              | 35 1/8            |

## MARKETS

## TORONTO MARKETS.

Cobalt oxide, black, \$1.05 per lb.  
 Cobalt oxide, grey, \$1.15 per lb.  
 Cobalt metal, \$1.25 to \$1.50 per lb.  
 Cobalt anodes, \$1.50 to \$1.75 per lb.  
 Nickel metal, 45 to 50 cents per lb.  
 White arsenic, 5½ to 6 cents per lb.

Mar. 23, 1917—(Quotations from Canada Metal Co., Toronto)—

Spelter, 14 cents per lb.  
 Lead, 12½ cents per lb.  
 Tin, 60 cents per lb.  
 Antimony, 35 cents per lb.  
 Copper, casting, 37 cents per lb.  
 Electrolytic, 39½ cents per lb.  
 Ingot brass, yellow, 23 cents; red, 25½ cents per lb.  
 Mar. 23—(Quotations from Elias Rogers Co., Toronto)—  
 Coal, anthracite, \$9.50 per ton.  
 Coal, bituminous, nominal, \$9.75.

## NEW YORK MARKETS.

Connellsville coke—

Furnace, spot, \$9.50 to \$10.50.  
 Contract (nominal), \$7.00 to \$8.50.  
 Foundry, spot, \$11.00 to \$12.00.  
 Contract, \$7.50 to \$8.50.

Straits Tin, spot, f.o.b. nominal, 55.50 cents.

Copper—

Prime Lake, nominal, 35.00 to 35.50 cents.  
 Electrolytic, nominal, 35.50 to 36.00.  
 Casting, nominal, 31.25 to 31.75 cents.

Lead, Trust price, 9.00 cents.

Lead, outside, nominal, 9.62½ to 9.87½ cents.

Spelter, prompt western shipment, 10.55 to 10.80 cents.

Antimony, Chinese and Japanese, nominal, 34.00 cents.

Aluminum—nominal—

No. 1 Virgin 98-99 per cent., 58.00 to 60.00 cents.  
 Pure, 98-99 per cent. remelt, 54.00 to 56.00 cents.  
 No. 12 alloy remelt, 38.00 to 40.00 cents.  
 Powdered aluminum, 85.00 to 90.00 cents.

Metallic magnesium—99 per cent. plus, \$3.00 to \$3.50.

Nickel—shot and ingot, 50.00 cents.

Electrolytic, 55.00 cents.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$120.00.

Platinum—

Pure, \$105.00.  
 10 per cent. Iridium, \$110.00.

Cobalt (metallic), \$1.70.

Tungsten, per unit—

Sheelite, \$17.50.  
 Wolframite, \$17.00.

Silver (official), 72¾ cents.

Metal Products—Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

Sheet Copper—

Hot rolled, 44.00 cents.  
 Cold rolled, 45.00 cents.

Copper bottoms, 52.00 cents.

Copper in rods (round), 42.00 cents.

Square and rectangular, 43.00 cents.

Copper wire, nominal, 40.00 to 42.00 cents.

Copper wire, April, May, 37.00 to 39.00 cents.

High brass—

Sheets, 39.00 to 40.00 cents.  
 Wire and light rods, 40.00 cents.  
 Heavy rods, 38.50 to 39.00 cents.

Low Brass—sheet wire and rods, 42.00 cents.

Tubing—

Brazed bronze, 51.75 to 52.00 cents.

Brazed brass, 48.00 to 49.00 cents.

Seamless copper, 47.50 to 50.00 cents.

Seamless brass, 43.00 to 47.00 cents.

Seamless bronze, 54.00 cents.

Full lead sheets, 11.00 cents.

Cut lead sheets, 11.25 cents.

Sheet zinc, f.o.b. smelter, 21.00 cents.

## STOCK QUOTATIONS.

As of close March 22nd, 1917.

(By courtesy of J. P. Bickell & Co., Toronto.)

## Ontario Gold Stocks.

|                                   | Bid.  | Asked. |
|-----------------------------------|-------|--------|
| Apex. . . . .                     | .09   | .09½   |
| Boston Creek . . . . .            | 1.16  | 1.18   |
| Davidson . . . . .                | .80   | .82    |
| Dome Consolidated . . . . .       | .05   | .11    |
| Dome Extension . . . . .          | .26   | .26½   |
| Dome Lake . . . . .               | .19   | .20½   |
| Dome Mines . . . . .              | 18.00 | 18.50  |
| Gold Reef . . . . .               | .03¾  | .04¼   |
| Hollinger Consolidated . . . . .  | 5.20  | 5.25   |
| Inspiration . . . . .             | .14   | .15    |
| Jupiter . . . . .                 | .31   | .32    |
| Kirkland Lake . . . . .           | .44½  | .47    |
| McIntyre . . . . .                | 1.86  | 1.87   |
| Moneta . . . . .                  | .12½  | .13    |
| Newray . . . . .                  | 1.30  | 1.31   |
| Porcupine Crown . . . . .         | .63   | .65    |
| Porcupine Gold . . . . .          | .01   | .02    |
| Porcupine Imperial . . . . .      | .03½  | .03¾   |
| Porcupine Tisdale . . . . .       | .02   | .02¾   |
| Vipond . . . . .                  | .44¼  | .45    |
| Preston East Dome . . . . .       | .04¾  | .05    |
| Schumacher . . . . .              | .58   | .60    |
| Teck Hughes . . . . .             | .71   | .74    |
| West Dome . . . . .               | .28¼  | .28½   |
| Gould. . . . .                    | ...   | .00¾   |
| Great Northern . . . . .          | .15   | .16    |
| Hargraves . . . . .               | .20   | .20½   |
| Hudson Bay . . . . .              | ...   | 45.00  |
| Kerr Lake . . . . .               | 4.30  | 4.50   |
| La Rose . . . . .                 | ...   | .53    |
| Lorrain Con. . . . .              | .33   | .35    |
| McKinley-Darragh-Savage . . . . . | .51   | .52    |
| Nipissing . . . . .               | 8.00  | 8.15   |
| Ophir. . . . .                    | .10¼  | .10½   |
| Peterson Lake . . . . .           | .12½  | .12¾   |
| Right of Way . . . . .            | .05   | .06    |
| Rochester Mines . . . . .         | ...   | .03½   |
| Seneca Superior . . . . .         | .01½  | .02    |
| Silver Leaf . . . . .             | .02¼  | .02½   |
| Shamrock Cons. . . . .            | .20½  | .22    |
| Temiskaming. . . . .              | .51   | .52½   |
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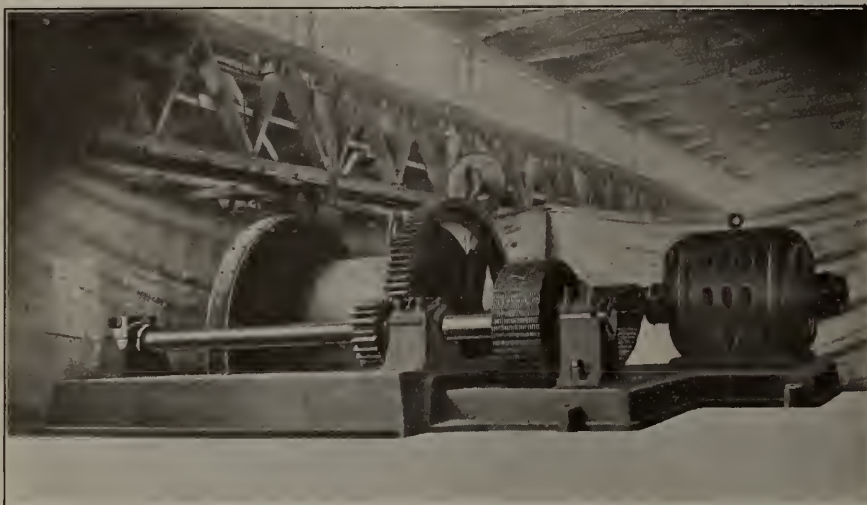
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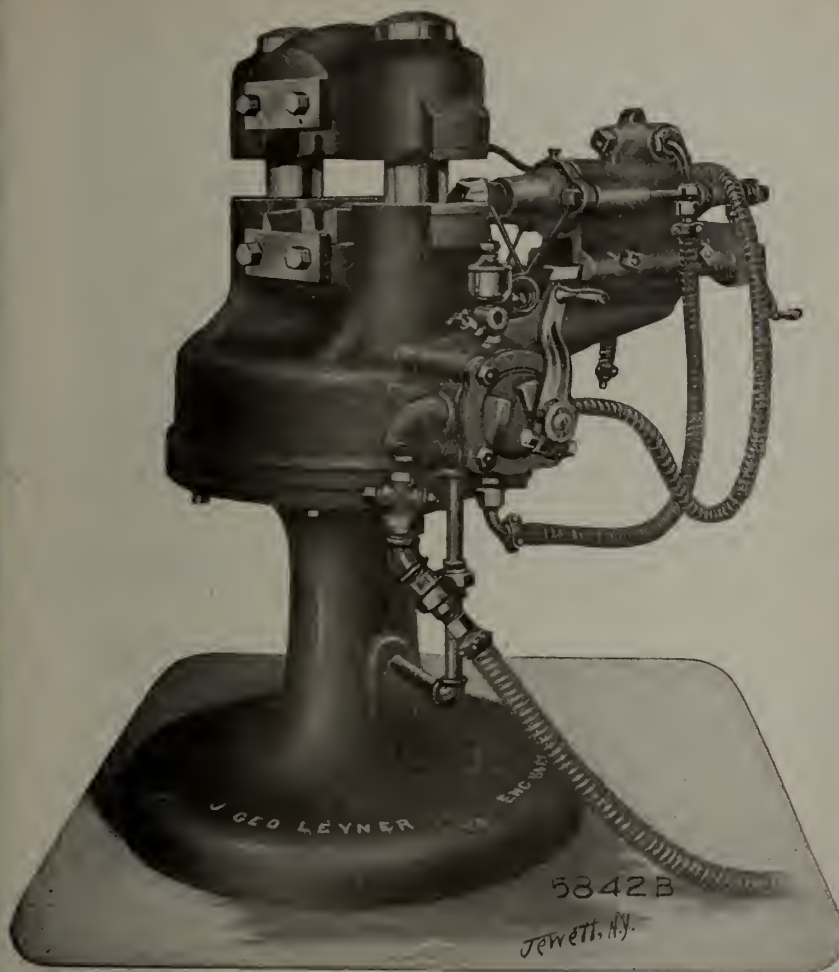
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- Ontario. Topography.
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- Map 66A. Brechin Sheet, Ontario and Victoria Counties.
- Map 150A. Ponhook Lake Sheet, Nova Scotia.
- Map 153A. Asquith and Churchill Townships, Sudbury District, Ontario.
- Map 158A. Nanaimo Sheet, Vancouver Island, British Columbia.
- Map 175A. Ymir, Kootenay, British Columbia.
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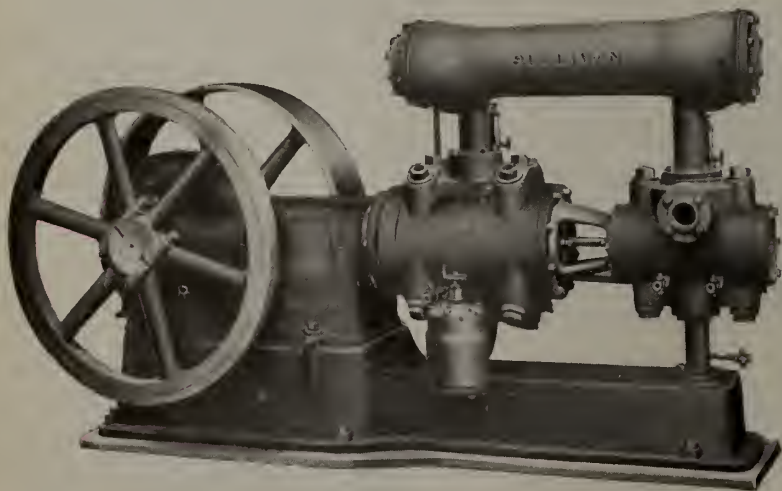
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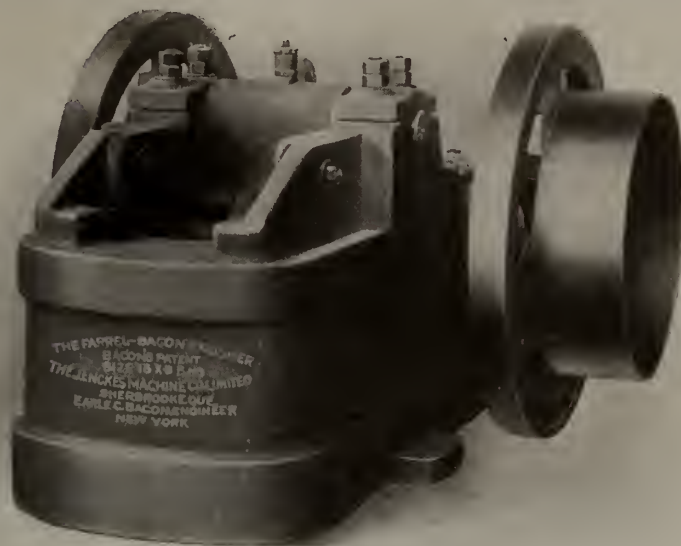
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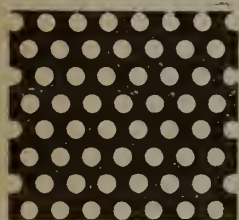
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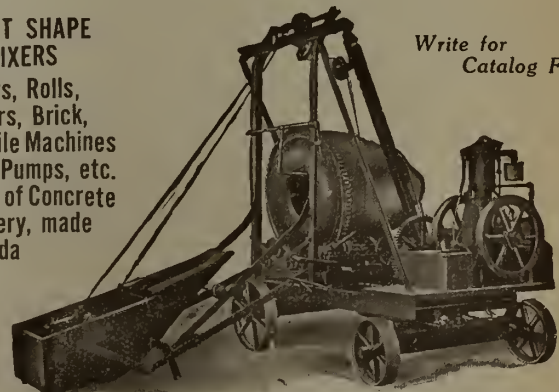
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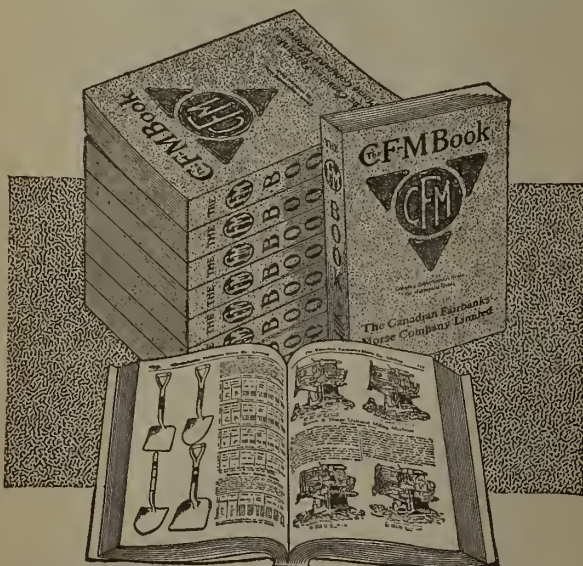
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, April 15th 1917.

No. 8

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

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Editor

**REGINALD E. HORE**

**SUBSCRIPTIONS** — Payable in advance, \$2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, \$3.00 a year.

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### THE NICKEL COMMISSION'S REPORT.

The report of the Royal Ontario Nickel Commission is summarized in this issue. Our readers will agree that very valuable work has been done and that the Province has been well repaid for the expenditure undertaken. The work has been arduous, but of great interest to the Commissioners and those who have assisted them, and has been accomplished in a masterly way. The choice of Commissioners has proven to have been an unusually wise one.

Few men are so well qualified to report on the Sudbury nickel industry as are Dr. Miller and Mr. Gibson. They have for years followed the struggles of prospectors and operators in their endeavors to establish industries in Northern Ontario. They have not been satisfied with simply recording the progress made; but have played an important part in the progress. They have not only kept themselves well informed and performed well the work which their positions call for; but have been ever ready to assist and encourage the pioneers. Through their kindly sympathy, their clear grasp of the situations that have arisen and their ability and willingness to help in overcoming difficulties, these two men have been a big factor in developing Northern Ontario. Happily also they have regarded before all else the best interests of the Province they serve and have not allowed their sympathy with the pioneers to prevent them from viewing clearly the interests of other citizens. While guarding especially the interests of the mining fraternity they have guarded also the common interests of the people of the Province.

Mr. Holloway brought to the Commission little special knowledge of conditions in Northern Ontario; but he brought a wealth of experience in metallurgical problems. His painstaking study of the nickel industry since he was appointed chairman of the Commission has enabled him to place before the Canadian public a masterly treatise on nickel and to give advice of great value to the Legislative Assembly of Ontario.

Mr. Young brought to the Commission valuable experience in legal matters. It is not easy to identify his contributions to the report; but we have no doubt that his services were of great value and that his knowledge of company matters and his study of the titles to the properties, of the dealings between the companies and the Province and of the system of taxation have been of much assistance in the inquiry and in formulating opinions.

While the Commissioners and the Secretary as individuals are entitled to great credit it is not difficult to see that a great deal of the credit belongs to the Ontario Bureau of Mines. The members of the staff of this exceptionally efficient Government Bureau have ably assisted in the work.

## CONSOLIDATED CO. HAS CLOSED ITS MINES AT ROSSLAND.

On March 31st, the Consolidated Mining and Smelting Company of Canada, Ltd., closed its mines in Rossland camp, British Columbia, for an indefinite period. This action is understood to have been taken for two reasons, first on account of the uncertainty of an adequate supply of coke being obtainable from the Crowsnest district of Southeast Kootenay, where the agreement between the coal-mine operators and the United Mine Workers of America, which controls the miners and other employees of the coal-mining companies operating in that district, and next in view of an expected concerted demand by the metalliferous miners throughout the district for an advance in wages of fifty cents a day.

In connection with the uncertainty of the supply of coke being sufficient for the continued operation of the company's copper blast-furnaces at Trail, it is manifest that no dependence can at present be placed on the Crowsnest district for the output of coke being maintained, for news was received in Victoria on April 2 to the effect that at the Crowsnest Pass Coal Co.'s colliery at Michel, the miners had stopped work, while similar action may be taken any day by those employed at the company's Coal Creek colliery. With the Michel mines and coke-ovens idle, the outlook for coke being obtained for the Trail blast-furnaces was less favorable; if the ovens at Fernie shall also be allowed to become inoperative, which must be the result if the miners shall suspend work at Coal Creek, whence comes the slack for burning into coke at Fernie, then the chances for obtaining coke for Trail, Grand Forks, Greenwood, and Northport smelting works will be small indeed.

In regard to the wages increase question, if the temper and attitude of the miners and smelter employees are correctly indicated by a "special" news despatch from Trail to the British Columbia Federationist, the "official paper of the B. C. Federation of Labor," printed on March 30, then the probabilities seem to be that the big mines in Rossland camp will not soon be reopened. That despatch follows:

"Trail, B.C., March 26.—In the territory of District No. 6, under the jurisdiction of the International Union of Mine, Mill, and Smelter Workers, is located the corporation known as the Consolidated Mining and Smelting Co. This company controls the greater part of the operations of mining and smelting ores in the Kootenay and Boundary country, and all of its properties are running full blast. During the last two years great changes have taken place in Trail. A zinc plant has been erected, which is turning out about thirty tons of refined metal every 24 hours, and a copper refinery has been added to the smelter, which was found to be too small. The manufacture of acid, which is necessary in the reduction process, is also carried on at the plant.

### "Unionism Not Favored."

"A recent statement of the general manager noted that \$1,000,000 had been expended in improving the plant, and that this was done for the purpose of turning out more metal products, the demand for which had increased with the result of increased prices. In making the demands from the management it was said that the smelter was operated at a loss, in face of the fact that metals had gone up in prices more than 50 per cent. This company does not want to have anything to do with the organization of District No. 6 if it can possibly help it, but the chances of winning concessions from this corporation were never more favorable

to the men than just now, and the district is taking advantage of this opportunity.

"The shortage of labor on the market, the intense demand for metal goods at high prices, and the fact that the Consolidated pays lower wages than any other company in British Columbia for the same kind of work, are circumstances that are of benefit to the workers in this part of the country. As a result of the activities of the district organization, the company has granted a raise of wages to all its employees of 25 cents per day.

### Strike Vote on Wages.

"The demands of the men are 50 cents per day increase, and the check-off system. A strike vote is being taken by the men on the enforcement of these demands. The sentiment of the men is to fight the issue to a successful conclusion.

"As a result of the construction work being about finished, a number of men have been discharged, and most of them have left for other fields to peddle their labor power.

"Full returns of the strike ballot are expected by April 1. It is advised that all men steer clear of the weaklings of the Consolidated until more remuneration for labor power has been arranged. The wages paid at Greenwood and Phoenix, where plants are operated by two different companies, are about 75 cents a day higher than is paid at Trail, and in the mines at Rossland, Kimberley, and other places controlled by the Consolidated."

### Difference in Conditions.

The statement made above that the Consolidated Co. controls the greater part of mining and smelting operations in Boundary district is quite inaccurate. This is manifest when it is seen that in 1916 the Granby Co.'s mines at Phoenix shipped to the company's smelting works at Grand Forks more than 1,000,000 tons of ore, and the British Columbia Copper Company's mines, Boundary, shipped to that company's smelting works at Greenwood about 276,000 tons, while the Consolidated Co.'s mines in the district made an output of only 15,156 tons. No figures are at hand to show the respective wages scales at Boundary and Trail smelting works, but so far as the products of the mines are concerned there is this most marked difference: For five years, 1911-1915 (the 1916 figures are not yet available), the total value of the output from Rossland mines was about \$16,635,000, of which \$13,785,000 was in gold, the price of which does not change, and only \$2,545,000 was in copper, while out of a total value for Boundary mines for the same period of approximately \$24,610,000 (not including the Hedley Gold Mining Co.'s gold production of \$3,797,000) only \$5,873,000 was gold and \$17,829,000 was copper value, the latter having in 1915 at any rate benefited from War prices.

### PORCUPINE MINERS DISCUSS WAGES.

Cobalt, April 10.—A meeting of the Porcupine branch of the Miners' Union was held Sunday in Timmins, and voting in that camp on the new wage scale is proceeding. In view of the fact that in other camps the vote is shaping up into a large majority in favor of the new scale, it is considered almost certain that the vote at Porcupine will fall in line. Complete returns are looked for by April 18. After that date it is understood the union will immediately take steps to acquaint the Government with their side of the question, and unless the increase is forthcoming in the meantime more drastic developments may be expected.



## CORRESPONDENCE

## MR. WHITE'S LEATHER MEDAL.

Editor, Canadian Mining Journal:

Sir,—I was very much pained on reading your reply to Mr. James White's letter concerning "Waste Through Duplication." You do not seem to be aware that although you do not appreciate his communication it has been honored in other quarters and has been the occasion of awarding a decoration. I am sure every one else but you, Mr. Editor, will consider that the decoration has been well bestowed and honestly earned. May it long decorate Mr. White's gallant bosom.

Your readers will be interested in hearing further particulars about this interesting event, although I have no doubt it will go against the grain with you to give recognition in any way to Mr. White's achievement. The Toronto Star Weekly has been in the habit of awarding leather medals to the "Perpetrators of Some of Life's Little Absurdities." These are awarded, to quote the words of that journal, "For the most ridiculous quotation from a Canadian newspaper, magazine, novel, advertisement, signboard, etc., due either to a typographical error, a bad English construction or somebody's blunder." The following quotation from Mr. White's letter in your issue of March 15th has been awarded a medal in the issue of the Toronto Star Weekly of 31st March: "This statement is essentially untrue and the fact that Dr. Frank D. Adams attached his signature to the report is sufficient to demonstrate its inaccuracy."

It is evident, Sir, that you have misunderstood Mr. White and also that he does not mean what he writes. Under these conditions would it not be possible to arrange terms of peace between you? I would be indeed proud if you would accept my good offices as mediator. Might I suggest that you would send me with the olive branch and a seasonable goodwill offering of colored Easter eggs (strictly new laid of course). This would no doubt lead to pourparlers and it is to be hoped the re-establishment of friendly relations. As you have not shown to advantage in this matter, I presume you will very likely not publish this letter. I am determined, however, that justice shall be done and will seek some other medium of publication if you decline to print this.

OBSERVANT READER.

## ACTIVITY IN MANITOBA.

The Pas, Man., March 30.—The caterpillar tractor for use by the Mandy Mining Company went north on Tuesday afternoon, having in tow three sleigh loads of supplies for the mine. The tractor is equipped with a sixty-horse-power engine. She will make the return trip here with twelve tons of copper ore.

Jack Hammill, who has been handling the Flin-Flon properties for his partners, will arrive on Saturday, when all the parties interested in the big deal will assemble to meet Hammill and sign up on the new arrangement.

Zar Crittenden is busy helping Smith & Durkee, the diamond-drill men, and their crews, in getting started for Flin-Flon. Huge quantities of supplies are being forwarded. Ten teams have been secured, and a contract let for 2,500 cords of wood, so that the diamond drilling can be pushed as fast as possible.

Work is now being rushed on the road from Mile 85, H. B. R., to Herb lake, and by June travelling should be possible over the new trail. This will be a great advantage, and will enable work to be carried on at all the properties with comparative ease this summer.

## OBITUARY.

At the annual meeting of the Canadian Mining Institute last month there was general regret that "Davy" Browne was unable to be present, for Mr. Browne has for years been one of the strongest men in the Institute. Illness prevented his attending the meeting, but we little dreamed that we were so soon to receive word of his death. The shock was keenly felt, for Mr. Browne had endeared himself to all who knew him well.

David H. Browne was a distinguished metallurgist and rendered great service to the industry. His work at Copper Cliff and New York was, however, not confined to metallurgical problems. He endeavored to brighten the lives of all those with whom he was associated, and in this he was exceptionally successful. While he will be remembered for his contributions to metallurgy, he will longer be remembered for his personal qualities and his love for his fellows. It is particularly to be regretted that this fine American, who spent so many years in Canada and was ever ready to fight for the rights of humanity, could not have lived to see the day when his native country should decide to defend those rights with all its power.

David H. Browne, metallurgist, author and speaker, was born June 8, 1864, at Hollymount, in the County of Mayo, Ireland. He passed successfully through the ordeal of the famous academy at Londonderry, and at the age of sixteen came to America, and continuing his scholastic career, graduated with the class of 1885 at the University of Michigan. Then followed a brief period of apprenticeship and training, first as chemist with the Joliet Steel Company, under Emmerton, then in a similar capacity at the Ludington mine, Iron Mountain, Michigan, and then back to the academic atmosphere of his Alma Mater as instructor in Inorganic Analysis, 1889-1890. There is no doubt that had he remained he would have been today a popular and successful professor, but luckily for the mining profession, the young Irish lad found the university life too tame, and, as he says himself, he couldn't stand the job, had to hear steam blow off and see the wheels go round, so worked till 1891 at the Andrews and Hitchcock blast furnaces, Hubbard, Ohio. In 1891 he entered the service of the newly organized Canadian Copper Company, as chemist, and since then his whole time had been devoted to the working out of the complex metallurgical problems, constantly occurring and persistently recurring in connection with the nickel-copper ores of the Sudbury field.

A published statement indicates the comparatively large amount of money now being paid out monthly at Butte, Montana, in connection with the mining industry. It gives the following information: The pay roll of the Butte district, including miners, clerical help, public service, corporations' employees, and others, for the month of February amounted to \$3,500,000. The Anaconda Copper Mining Co.'s pay roll for the shortest month in the year was \$1,638,182, and this was for Butte alone. It is estimated that the public service corporations, the corporations other than mining, the other mining companies, and the business houses together paid out an amount large enough to make up the remainder of the total of \$3,500,000. When it is considered that Butte has at present a population of 110,000, it means that the mines alone pay what amounts to an average of about \$24 a month for every man, woman and child in that city.



## REPORT OF ONTARIO NICKEL COMMISSION.

The Royal Ontario Nickel Commission, appointed by the Ontario Government on the 9th September, 1915, to investigate the resources, industries and capacities of Ontario in connection with nickel and its ores, has presented its report. The Commissioners are Geo. T. Holloway, Associate of the Royal College of Science, London, and Vice-President of the Institution of Mining and Metallurgy, an English metallurgical expert of high repute; Dr. W. G. Miller, Provincial Geologist, and McGregor Young, K.C., a well-known barrister of Toronto. Thomas W. Gibson, Deputy Minister of Mines, acted as Secretary.

After references to the various countries they visited, including the United States, Great Britain, France, Norway, Cuba, Australia and New Caledonia, and to numerous mines, works, plants, smelters, etc., on this side of the Atlantic and on the other, and also to their interviews and conversations with Mr. Bonar Law, then Secretary of State for the Colonies, and other British Government officials, the Commissioners go on to say:

"The two questions that have been uppermost in the numerous discussions that have taken place concerning Ontario's nickel industry during the last twenty-five years, are: (1) Can nickel be economically refined in Ontario, and (2) Are the nickel deposits of Ontario of such a character that this province can compete successfully as a nickel producer with any other country. It will be seen that the Commissioners have no hesitation in answering both of these questions in the affirmative."

The Report goes on to state that the Commissioners are of the opinion:

"(1) The nickel ore deposits of Ontario are much more extensive and offer better facilities for the production of nickel at a low cost than do those of any other country. Nickel-bearing ores occur in many parts of the world, but the great extent of the deposits in this Province, their richness and uniformity in metal contents, and the success of the industry, point strongly to the conclusion that Ontario nickel has little to fear from competition.

(2) Any of the processes now in use for refining nickel could be successfully worked in Ontario, and conditions and facilities are at least as good in this Province as in any other part of Canada.

(3) In view of the fact that practically no chemicals are required, that there is a much more complete saving of the precious metals, especially platinum and palladium, and that electric power is cheap and abundant, the most satisfactory method of refining in Ontario will be the electrolytic.

(4) The refining of nickel in Ontario will not only benefit the nickel industry, but will promote the welfare of existing branches of the chemical and metallurgical industries, and lead to the introduction of others.

(5) The methods employed at the Ontario plants of the two operating nickel companies are modern and efficient, although there are differences in both mining and smelting practice. It is the consistent policy of both companies to adopt all modern improvements in plant or treatment. Even during the present time of acute pressure the Canadian Copper Company has materially increased its output without substantial enlargement of its plant, and the losses in smelting are less, both at Copper Cliff and the Mond plant at Coniston, than they were a year ago.

These companies have each had their experimental stage, neither has asked nor received any government assistance, and both have earned the success which they have achieved.

(6) The present system of mining taxation in Ontario is just and equitable and in the public interest, and is the best system for this Province. Any question of change is rather one of rate than of principle. This important question is dealt with at some length in Chapter XII.

Experiments have been undertaken by the Commission in the production of nickel-copper steel direct from Sudbury ore, and also in the electrolytic refining of nickel. Certain improvements in the latter process have been made the subject of application on behalf of the Government of Ontario for patents in Canada, United States and Great Britain."

The Commissioners are gratified at the assured prospect of the erection in Ontario of two large plants for the refining of nickel; one by the International Nickel Company of Canada, Limited, at Port Colborne, and the other by the British America Nickel Corporation, Limited, probably at Sudbury, if a supply of electric power can there be obtained.

There is reason to believe that the cost of refining in the International Nickel Company's new plant at Port Colborne will be less than at their existing works in New Jersey; and if so, the natural tendency will be to enlarge the refining capacity in Ontario from time to time. Provision for doubling or even quadrupling the initial output of 7,500 tons has been made in planning the refinery.

The question of a market for nickel ore or low grade or other matte by small producers, has received the attention of the Commissioners. Little ore is being mined at present, except by the large companies. Representatives of the British America Corporation have expressed their desire to discuss the subject of custom smelting and refining with the government. An arrangement for custom smelting and refining with this corporation, in which the British Government has a controlling interest, should serve all the needs that may arise.

The suggestion has been made that government ownership would solve many of the questions which have been raised in connection with these deposits. To expropriate the deposits and plants of the Sudbury nickel area would, judging from sales of company shares, probably cost not less than \$100,000,000. This is a sum approximately equal to the total paid-up capital stock of all the chartered banks in Canada. There does not seem to be any good reason why the people of Ontario should be asked to adventure so large a sum of money as would be required for the purchase of the nickel deposits and plants.

There is no certainty that large profits can be made every year from the nickel industry. The present activity is in part due to well understood causes, which it is to be hoped will never recur. In the past the output has had to be curtailed at times. If the price of nickel should fall, profits will naturally decrease. The nickel industry is to a considerable extent dependent for its success on the highly trained and specialized technical men who superintend it, and who command salaries far beyond those which are paid in the government service to the most highly placed employees. Besides, nickel is not a necessity of life nor an article of universal consumption or use, and the nickel business is in no way comparable to those connected with the operation of public utilities, where government ownership may be beneficial or expedient.



The Commissioners have had the advantage of consulting producers and leading consumers for different purposes in Great Britain and the United States. The opinion is general that the uses of nickel will be extended, and that when normal peace conditions are fully restored, the demand will be greater than it was before the war. A reduction of the price would undoubtedly enlarge the consumption and call for increased production.

The question of competition from other countries is of primary importance.

While competition is not to be feared, it would be futile to try to shut off the supply of nickel from almost any of the great nations. Nearly every important country has supplies of nickel ore which can be worked if the demand is great, thus ensuring a high price.

In the early years of the development of the Ontario nickel industry grave difficulties were encountered. Of the three pioneer companies, only the Canadian Copper Company has survived. The chief difficulties were the economical treatment of the ore, the prejudice of the trade against Canadian nickel, and the limited market. Gradually, and not easily, the obstacles were overcome, and from a weak and precarious infancy, the Sudbury nickel industry has grown to be one of the great metal industries of the world. The market for nickel is much more restricted than for iron, copper and other so-called common metals. Production has to be more closely considered in relation to consumption. Statistics show that at certain periods the output of nickel from Sudbury ores has not shown a normal increase; it has occasionally decreased. This has been chiefly due to the fact that consumption has not kept pace with production. Much has been done by the refiners of Ontario nickel by means of advertising and research to increase consumption and to enlarge the markets.

**The proven, or positive, ore of the Sudbury area can be conservatively put at 70 million tons, while it is safe to say that the proven, together with the probable and possible ore supply, exceeds 150 million tons. The International Nickel Company's published estimate of their ore reserves is 57 million tons, which is for three mines only. Although the Sudbury deposits have been worked for twenty-nine years, there is vastly more ore proven in the district to-day than there was five years ago.**

In the last few years the proven reserves in the Creighton, Frood and Crean Hill mines of the Canadian Copper Company (International Nickel Company) have been very largely increased. The historic Copper Cliff mine is not exhausted, but is lying dormant simply because the company can mine ore more cheaply from other properties.

Of the Mond Nickel Company's properties, neither the Victoria, the oldest mine of this company and the deepest mine of any kind in Ontario, nor the Garson, another of its older mines, shows signs of exhaustion. The great Levack property has been developed only within the last three or four years into a mine now known to have at least 4,500,000 tons of ore, and it may be added that the ore of this mine has been found to be of higher grade than was thought to be the case in any of the properties in the north nickel range. The Worthington mine, that lay unworked for years, has lately been reopened and possesses important reserves.

The Murray mine, now owned by the British America Nickel Corporation, was operated in the early years of the nickel industry in Sudbury and thought to be of little importance. This mine lies right on the

main line of the Canadian Pacific Railway, three miles from Sudbury, and is one of the best examples that can be cited of a great mine lying for years, after its discovery and after considerable work had been done on it, with its importance unrecognized. Several companies had options on it at various times after the Vivians ceased work over twenty years ago, but it is within only the last four or five years that its greatness has been determined. Diamond drilling has proved that it and the adjoining Elsie property contain at least 8,500,000 tons of ore.

The apparently important discovery by the Longyear syndicate, during the last few months, of nickel ore bodies underlying the heavy covering of drift in the township of Falcenberg, east of the Garson mine, should also be mentioned. The discovery was made by means of diamond drills and proves, what the geological conditions would suggest, that not all the nickel deposits of the district are exposed at the surface. The existence of the Alexo mine, Temiskaming district, in actual operation, so far from Sudbury, is significant of possibilities outside of that area.

**No such vast deposits of workable ores, considered as a source of metallic nickel, are known in any other country, and there is no reason to believe that any competition will arise with which Ontario cannot cope.**

The competition of New Caledonia calls for special mention. The question has received careful consideration from the Commission, and, in view of its importance, one of the Commissioners, accompanied by the Chief Inspector of Mines, visited and spent some time on the island, where, by the courtesy of the French Government and the officials of the operating companies, they were able to secure first-hand information in regard to its resources and prospects.

For many years New Caledonia dominated the nickel market of the world. With its accumulated experience, the financial support of the Rothschilds, a trade prejudice in favor of its product, and long and favored connections with the principal consumers in Great Britain and elsewhere in Europe before and after the advent of Ontario as a producer, New Caledonia has been unable to keep pace with her younger rival.

When the Sudbury industry began, practically the whole of the world's demand for nickel was supplied from New Caledonia. In 1900 about 65 per cent. of the world's nickel came from New Caledonia and about 35 per cent. from Canada. The world's output has increased fivefold since that time, and Ontario now produces over 80 per cent. of the whole. The production of Ontario in the last 15 years has increased ninefold; the production of New Caledonia by less than 20 per cent.

The chief factor that has enabled Sudbury to outdistance its only serious rival is the difference in the size of the ore bodies in the two countries. The principal Ontario deposits contain ore that is measured in tonnages of millions, while those of New Caledonia are reckoned in a few hundreds of thousands. The greatest of her deposits contained about 600,000 tons; few reached 250,000.

A determination of the ore reserves in New Caledonia is not possible owing to their uncertain character, but it is probably fair to say that the colony possesses at least as much high-grade ore as she has already mined in the forty years of her existence as a producer. This would give a total of, say, 160,000 tons of metal, which would represent about four years' output from Sudbury at the present rate of production.

There being many deposits for selection, the first mines to be worked were naturally the most accessible,



and usually those near a harbor. Many mines that were once worked are now abandoned, including the Borbet, which has the record of having been the largest producer. The production of the larger mines is decreasing, and mines such as the Emma, in more inaccessible situations are now being opened, necessitating the extension of the railways farther into the interior of the island. There is no evidence to show that any of the new nickel mines are larger than some of the old ones, or that ore can be produced more cheaply from them.

The essence of the whole matter in so far as competition from New Caledonia in the open market is concerned, is the cost of the refined nickel produced from its ores. More than a dozen years ago the cost was approximately 19 cents a pound. Immediately prior to the war it had not been lowered. At present with excessive freight rates and increased prices for supplies, the cost is much increased. As long as the price of nickel remains about the same as it has been during recent years, New Caledonia will have an important industry. It will probably expand to some extent, owing especially to the activities of the newer of the two companies that are shipping ore and smelting on the island. But there is no good reason for believing that the competition with Ontario will become any stronger than it has been in the past. Should the price of nickel fall to 25 cents a pound or less, New Caledonia will have difficulty in keeping her mines in operation.

While it is true that Ontario has no monopoly, it possesses many advantages over all competitors, even under the present conditions of the market as to prices and trade connections. In any keen competition as to prices it is doubtful whether any other locality at present known or suggested could compete with Ontario. It is a matter of record that at one time of low prices the leading New Caledonia company was compelled to suspend all dividends. It may be doubtful, further, whether anything but an arrangement of the market between the great interests can prevent the complete domination of the world's trade by the nickel industry of Ontario making the best use of its exceptional resources.

#### Refining Processes.

There are three processes, which may be described as standard methods, in use for the refining of nickel from ores like those of Sudbury. These are (1) the Orford process, employed for the treatment of the matte produced by the Canadian Copper Company, (2) the Mond process, and (3) the Electrolytic process. For all these processes, the production of a matte is essential. Matte is made by substantially the same method for all three.

#### The Orford Process.

The Orford Process is the oldest of the three. It is cheap to operate, and permits of a large output in a confined space, but it does not recover more than a small proportion of the precious metals present in the ores, and there is reason to think that losses of nickel and copper are heavier than in either of the other two processes.

In the Orford process, the matte is smelted with sodium sulphate and carbonaceous matter, such as coal or coke, so that a large proportion of the copper is separated as a double sulphide of copper and sodium, when tapped from the furnace; this separates as an upper layer above a matte which is much richer in nickel and poorer in copper than the original matte. A repetition of the smelting of this highly nickeliferous matte results in a further separation of copper in

the same way, so that finally, the bulk of the copper is obtained as a slag (which is smelted to produce blister copper) together with a matte so rich in nickel and so poor in copper that, after being roasted and leached with acid, to remove the remainder of the copper which it contains, it can be smelted in a reverberatory furnace, for the production of metallic nickel. The leaching processes result in the production of a considerable amount of copper sulphate and nickel sulphate. The former is treated for the production of metallic copper, but the latter is, to a considerable extent, crystallized out, and either treated electrolytically for the production of high-grade electrolytic nickel, or sold as nickel sulphate or as the double sulphate of nickel and ammonium for electro-plating and other purposes.

The Orford process, being partly chemical, produces large quantities of noxious effluents. At the Bayonne works over 150 million gallons are annually run into the sea. The plans for the new works at Port Colborne, Ontario, provide for the elimination of this discharge.

#### The Mond Process.

The Mond Process treats a matte of somewhat different composition, because, although it contains about the same total quantity of nickel and copper, the relative proportions of the two are very different. The matte from the Canadian Copper Company averages about 54 per cent. nickel and 25 per cent. copper, whereas that from the Mond Nickel Company is much richer in copper and averages about 41 per cent. nickel and 41 per cent. copper. These differences are due to the composition of the ores treated by the two companies. The matte is refined at Clydach in Wales. In this process there are probably the smallest losses either of nickel, copper, or the precious metals.

The process comprises roasting to remove the sulphur, leaching with sulphuric acid to obtain a large proportion of the copper, which is ultimately crystallized out and sold as copper sulphate, and the reduction of the oxides of nickel together with the small quantity of copper left in the roasted and leached matte with producer gas, which reduces the iron, copper and nickel to the form of finely divided metal. This material is next treated in a vertical chamber or tower with producer gas at a special temperature, by means of which the nickel is converted into a volatile compound known as nickel carbonyl. This passes to another chamber or tower, where it is exposed to a higher temperature, whereby it is decomposed so that the metallic nickel is deposited on a number of slowly descending grains of nickel previously added in the form of small shot. The residues from the first treatment are either again treated with sulphuric acid to remove the copper and iron, or are smelted again, after which the nickel they contain is recovered by repetition of the treatment. The residues are finally separated and sold for their precious metal contents. The nickel produced is of high purity, and has an excellent reputation.

It may be mentioned that the leaching described as being done upon the original roasted matte, dissolves a considerable quantity of nickel as well as of copper. This is recovered and sold as nickel sulphate, or as nickel ammonium sulphate, for electro-plating and other purposes. The Mond Nickel Company does not make or sell any metallic copper.

#### The Hybinette Process.

The Hybinette Process, employed in Norway, and about to be employed in Ontario by the British America Nickel Corporation, deposits the nickel electrolytically, using soluble anodes made from partly roasted nickel copper matte. The copper is obtained



as a crude blister copper, by treating it with the scrap anodes from the electrolytic nickel production. The copper thus produced is melted into anodes and electrolytically purified. Without going into details, it may be stated that the Hybinette and other electrolytic processes produce nickel and copper of high quality and with small losses, and that they recover the bulk of the precious metals.

One great advantage of the electrolytic process is that, although the plant occupies considerable space, it can be erected at short notice, and units can be added to the plant, to any extent, as the output requires.

No attempt is at present made in working any of the above-described processes to recover the sulphur, which all goes to waste as fumes, except a small portion which, in the electrolytic method, becomes converted into sulphuric acid and is used as such in the process.

The Province of Ontario is fortunate in possessing an abundance of water power. In the absence of coal mines this is a feature of great importance in connection with her mining and mineral industries.

The special bearing of this abundant and cheap supply of water power on the nickel industry, consists not only in the use of electric energy generated therefrom in the operation of mines, smelters, etc., but also in the fact that it enables the electrolytic method of refining nickel to be employed under advantageous conditions as to cost. The Hybinette electrolytic process is the one adopted by the British America Nickel Corporation for the refinery it is to erect at Murray Mine.

#### Costs of Refining.

There are three steps in the production of refined nickel, namely, mining, smelting and refining. Heretofore, as regards the Sudbury industry, only mining and smelting has been done in this country, the Mond Company refining in Wales, and the International Company, of which the Canadian Copper Company is the Ontario branch, in New Jersey.

The Mond Company have furnished the Commissioners, confidentially, a complete statement as to the costs in each of the three stages; the International Nickel Company have furnished a statement of costs for mining and smelting, but have declined to furnish costs for the third stage, namely, refining. The British America Nickel Company, now beginning operations in Sudbury, have supplied an estimate as to cost of refining nickel by their process, as well as the cost of operation of this process in Norway, where it has been employed for some years.

Regarding processes and costs of refining nickel, the enquiries made by the Commissioners have led them to the following conclusions:

The respective costs of producing refined nickel from the Sudbury ores by each of the three processes mentioned do not differ to such an extent as to give any one process a material advantage over the others in competition.

An electrolytic process has been a commercial success on lower grade ores in Norway. The use of electrolytic processes by all the companies operating in Ontario would not prevent their meeting competition from any other quarter.

The costs of production are gradually falling through increased efficiency and larger output, and may be still further reduced. War conditions, resulting in scarcity of labor and increased cost of supplies, are for the present exercising an influence in the opposite direction.

The International Nickel Company, until recently, contended on commercial grounds that the Orford process could not be profitably operated in this Province. These contentions were largely based on comparative costs as between New Jersey and Copper Cliff. Evidently they do not now apply to the north shore of Lake Erie, where, at Port Colborne, this company is building a refinery.

The Mond Nickel Company allege that by reason of the greater expense due to higher wages, increased cost of fuel and chemicals, and higher freight charges, refining in Ontario would make a material addition to the cost of their products, namely, refined nickel and sulphate of copper. The company have supplied the Commission with figures in support of this view. A special argument is based upon the necessity of quick delivery for copper sulphate, which is marketed in the vine-growing countries of the Mediterranean, and is required only during a limited season of the year for destroying blight on vines.

There is nothing to prevent the Hybinette process, of the British America Corporation, being operated as cheaply and as efficiently in Ontario as elsewhere. The costs at Sudbury will be less than they have been in Norway, owing to the larger scale of the operations in Ontario.

#### Price of Nickel.

At about the time mining began in New Caledonia, in 1875, the price of nickel, according to a report made to the government of France, was 18 francs a kilogram (\$1.58 per lb.). It fell successively to 10 francs, 5 francs (1892), 4 francs (1894), 3 francs (1895), and, owing to Canadian competition, to 2.40 francs a kilogram (21 cents per lb.) at the end of 1895. In 1902 the price was between 3.50 and 4.00 francs a kilogram (30 to 35 cents per lb.). During recent years the price has been about the same. A higher price has been charged in selling small quantities, and at times a considerably lower price for large quantities on long-term contracts.

The Commissioners were informed by the British Government in May, 1916, that it was obtaining all its supplies from four companies at £175 sterling per long ton. This is equal to 38.8c. per lb. The ruling price in England was then £225 sterling, about 49c. per lb. Prior to the war the price to the British Government was £160 sterling per ton (34.8c.); on the other hand, a user in Birmingham stated that in May, 1916, he was purchasing in five-ton lots at £200 per ton (43 1/4c.), and that the steelmakers paid less. Henry Wiggin and Company Limited, of Birmingham, quoted before the war, in September, 1913, £165 per ton for hundred-ton lots, rising to £171 per ton for lots under five tons, or 1s. 8d. per lb. for smaller lots.

Since the war began there has been an increase in price, but not a large one compared with other metals, little, if anything, more than sufficient to cover the increase in cost of labor, freight and insurance. The influence of the long-term contracts, upon which nickel is usually sold, has no doubt tended, along with the elimination of Germany as a market, to keep down the price.

The statistics of value placed upon the nickel and copper contents of the matte in the returns of the producers to the Ontario Bureau of Mines, are merely nominal, being for the Canadian Copper Company, 10 cents per pound for nickel and 7 cents for copper, and for the Mond Nickel Company, 15 cents for nickel and 7 1/2 cents for copper. These figures remain stationary from year to year, not fluctuating with changes



in the prices of the metals. In the case of the Canadian Copper Company, they appear to have been adopted because they represent the price at which the company sold the matte to the Orford Copper Company before both concerns were merged into the International Nickel Company in 1902. The practical effect is to credit the entire profits of the business to the refining stage, and to eliminate them from the mining and smelting stages. This is a convenient method for the companies, since no real change of ownership takes place between the mine and the finished metal. The result, however, is to unduly depress the figures of value in the Ontario statistics, and in dealing with the figures for 1915 the Bureau of Mines adopted a valuation of 25 cents per pound for nickel and 10 cents for copper in the matte. The latter figure has been increased to 18½ cents for 1916, since the price of refined copper has risen to an unprecedented height.

#### Losses in Mining, Smelting, and Refining.

The losses in each department are considerable, but in mining and smelting, at any rate, they are well recognized by the two large operating companies. It may be taken for granted from what the Commissioners have seen of the efficient working of these companies, and from the analyses supplied, that everything is being done to minimize these losses, so far as meets the requirements of companies having large quantities of rich ore for immediate use and in reserve, and very large supplies of low-grade ore proved and ready for working when needed.

As to losses in refining, it may be said that there is more room for improvement in the treatment of a matte containing about 80 per cent. of metals, nickel and copper, than in the simple production of such matte.

The losses on the roast-heaps through leaching are not definitely known, although they have been estimated by the Canadian Copper Company at about 11½ per cent. of the total copper and nickel.

In addition to losses in mining, and the leaching losses on the roast-heaps, the losses by the Canadian Copper Company in the slags from the smelting at Copper Cliff amounted in the year ending March 31, 1916, to about 8.9 per cent. of the total nickel, and about 9.6 per cent. of the total copper. Although their work is carried on with great efficiency, and it is not suggested that these losses can be reduced, the total, reckoned on 1,227,187 tons of ore raised in 1916, reaching, as it does, 3,100 tons of nickel and 1,400 tons of copper per annum, indicates the importance of any improvement which can be made in metallurgical practice.

The smelting losses of the Mond Nickel Company may be taken as similar, except that their roast-heap losses are less, as they employ heap-roasting to a much smaller extent.

The Commissioners have to express their appreciation of the frankness with which both companies have discussed the question of losses, and their willingness to consider any possible means of lessening them. They point out, however, and the Commissioners agree, that there is no reason to anticipate much further saving on smelting operations, and that the losses in the smelting of nickel-copper ores are always likely to be greater than those inherent in ordinary copper smelting, with which the treatment of the Sudbury ore is fairly comparable.

The losses in mining will be gradually reduced as the grade of ore mined becomes lower. That processes of flotation will in the future be applied to the Sud-

bury ores there is good reason to expect, and it is most probable that such processes will enable a larger proportion of nickel to be obtained from a given mine than at present. This will be effected, however, rather by making it possible to treat low grade ores necessarily or conveniently raised while extracting those of better grade, than by stopping actual leaks now existing in any of the stages of treatment. These leaner ores are now left in the mine, or in some cases are stored in dumps, but as the cost of obtaining them is small, being largely covered by that of mining the better ores, they could probably stand the additional expense of concentrating by flotation. A positive gain of this kind is as beneficial as an improvement in metallurgical processes for the prevention of actual smelting and refining losses, and is quite in keeping with the tendency of modern metallurgical methods.

#### High Average Content of Sudbury Ores.

It may be added that although the amount of nickel and copper varies from time to time in the different deposits, the average of the ore from the several mines has not shown any serious falling off. The copper may have increased relatively to the nickel, or the reverse may have been the case, but any increase in the amount of copper, so far as the Canadian Copper Company's deposits are concerned, appears to have been due to the inclusion of more rock matter, which is richer in cupriforous mineral than the massive ore. The whole of the Sudbury deposits have shown wonderful continuity, and the ratio of nickel to copper, commonly given for the whole field as two to one, is remarkably near the truth. The Mond Nickel Company's ore averages more nearly one to one, but this is due to the fact that the company has acquired properties which are inherently richer in copper than nickel, and that it is actually desirous of having a larger proportion of copper in their ore, on account of the ready sale of the copper sulphate, which is one of the primary products of its process, as contrasted with that of the International Nickel Company.

#### Sulphur Fumes.

A chapter of the report is devoted to the discharge of sulphur, in the form of sulphurous acid, in roasting, smelting and refining the Sudbury ores. While the subject has received attention from the operating companies, it has not been found possible to make any economic use of the large quantities of sulphur that are thus wasted. Attempts are constantly being made to minimize the damage caused by the escape of sulphur. It is believed that in the not distant future smelting methods will be developed that will do away with conditions that now exist.

The roast heaps are the worst offenders both in quantity and in injurious results. Roasting during the winter months is less harmful than at any other season of the year. The Mond Nickel Company is not now roasting during the summer months, and is making arrangements with a view of discontinuing roast heap practice altogether if possible. The British America Nickel Corporation does not intend to use roast heaps. The Canadian Copper Company has roast heaps continuously in operation carrying a total of about 250,000 tons of ore. The injurious effects will be considerably lessened by the recent change in location of the roast yard. Apart from the question of nuisance and injury, the roasting of the ore in heaps is not the best or most efficient metallurgical practice, and involves unavoidable losses of both nickel and copper. The sulphur driven off at the roast heaps,



amounting to over half of the total discharge, cannot be recovered. The Commission estimates that the total yearly discharges from the heaps, smelters and refineries, is not less than 300,000 tons of sulphur discharged in the form of sulphurous acid gas, and capable of producing nearly a million tons of ordinary sulphuric acid. This is equal to about one-quarter of the total annual consumption of the United States, of which one-fourth (1 million tons) is produced from the discharged gases from smelters, and exceeds all probable requirements of Canada for many years.

In other countries the recovery of sulphur and other noxious gases has ultimately resulted in the development of important industries. Sulphurous acid gas could be utilized direct in pulp-making and other industries, but the present conditions are not favorable for such use, owing to the distance of such plants from Sudbury. Freight charges on sulphuric acid to points of consumption are considered to be too great to permit of the development of this industry at present. The most desirable method of recovering the sulphur, if feasible, would be as free sulphur, which can be easily transported and for which there is a good demand.

#### Precious Metals in Sudbury Ore.

The Sudbury ores contain minute quantities of the precious metals. Besides gold and silver, these include platinum, palladium and other rarer members of the platinum group. The ores cannot be profitably treated for these metals alone, but the smelting process automatically concentrates them in the matte, and thus makes it practicable to recover them.

In view of the usefulness and scarcity of platinum, the supply of which is being eked out by substituting palladium wherever the latter is suitable, every source of the metal is worthy of investigation, and every effort should be made within economic limits to obtain it.

#### Trade Conditions.

Prior to the war nickel was sold like any other metal to any country in which there was a market for it, and it was treated solely as an article of commerce without regard to international relations. The Commissioners found no evidence of any arrangement for dividing the markets between the great producing companies, although the International Nickel Company has the benefit of the United States duty on imports against its competitors.

The great French company, La Societe le Nickel, had a branch works in Germany at which it refined part of its New Caledonia output. The whole of the Norwegian supply of metal has been sent to Germany during the war. In the United States, where by far the greater part of the nickel refined is of Canadian origin, considerable nickel is produced from New Caledonia matte and as a by-product from the refining of crude copper, and scrap metal containing nickel is also available. Almost every great power has deposits of nickel ores which can be worked when the price of the metal is sufficiently high, and from which its requirements in time of war could largely be secured.

There has been much discussion concerning the possibility of Canadian nickel reaching enemy countries during the war. While the question is not within the jurisdiction of the Commissioners, it was referred to in the conferences with officials of the Imperial Government. For reasons of public policy the measures taken by the Government in regard to nickel, copper, rubber and other contraband materials cannot be disclosed.

#### BUILDING THE NICKEL REFINERY AT PORT COLBORNE, ONT.

A report on progress by the International Nickel Company on construction of the nickel refinery at Port Colborne, dated Feb. 5, 1917, contains the following information:

The site selected by The International Nickel Company of Canada, Limited, for its Canadian nickel refinery is at Port Colborne, Ontario, somewhat to the eastward of the entrance to the Welland Canal. The site consists of approximately three hundred and fifty (350) acres in extent, with a frontage on Lake Erie of approximately one (1) mile, this frontage immediately adjoining the Lake Erie frontage of the Canadian Furnace Company. Transportation facilities for the refinery will be provided by direct connection with the Grand Trunk railway, a branch line of which passes the northern boundary of the refinery site. The position of the site with respect to the Welland canal is such that recourse may also be had to transportation by water for such commodities as will be utilized in the refinery in large quantities, such as coal and coke, and where, owing to their points of origin, such water transportation may be deemed advisable.

This site was selected and options taken upon the property about the first of August last after examination of many possible sites in various parts of the Dominion. Preliminary engineering work, and surveys and testing of the suitability of the sites for foundation purposes were then proceeded with, concurrently with the examination of title, and certain necessary legalities with the local councils were arranged. Title was taken to this property early in October, and active construction on the ground immediately commenced. After the preliminary engineering work had shown the suitability of the site for the plant, a contract was entered into with The Foundation Company, Limited, of Montreal, which company has charge of the entire piece of construction. This company, in conjunction with the operating and engineering departments of The International Nickel Company, engaged actively in the preparation of the general and detailed plans of plant buildings and equipment, and by so doing, were in position by the time title to the property had been taken, to immediately commence construction and to let contracts for the more important building materials and equipment, on which delayed deliveries were expected.

The estimated cost of the completed refinery will be approximately \$4,000,000, and it is expected that the refinery will be completed and ready for operation in the autumn of 1917, provided no greater shortage of labor is experienced than that already apparent, and that the sub-contractors will be enabled to fulfil their promises of delivery.

On the construction work now in active progress, about four hundred men are being employed, and preparations have been made so that by next spring employment will be available for about one thousand men on this construction. The railroad connections, sidings and yard tracks, in which there are about 18,000 feet of track, requiring four hundred tons of rails, together with the grading, amounting to 270,000 cubic yards, are well under way. The excavating for foundations of buildings is well along, and many of the foundations of the permanent structures are already in place. This will ultimately amount to about 80,000 cubic yards.

The basis of the lay-out of the refinery provides that the buildings are so placed that various stages of



the process are segregated, and the economical handling of the labor and materials is obtained, liberal allowance being given to provide for future extensions. Practically all of the buildings are of steel and brick construction, 10,000,000 pounds of structural steel being estimated for this work. This structural steel will be supplied, fabricated and erected by the Dominion Bridge Company of Montreal. There will be 51,000 tons of concrete for building foundations, and 350,000 square feet of forms for concrete work. Contracts have been placed for the 6,000,000 bricks required, these being manufactured in the Hamilton district. The great bulk of general supplies is being purchased in Canada, and only under special circumstances are materials for construction and process equipment being imported.

The two main refinery stacks of radial brick construction will be amongst the largest yet built, being 350 feet high and 12 feet diameter at the top, the base of each of these stacks being of massive concrete construction 40 feet by 40 feet.

Special attention has been given to lighting and ventilation, there being 130,000 square feet of windows in the main buildings and 300,000 square feet, or over seven acres of roofing. The workshops are to be most complete and equipped with modern machine tools and labor-saving devices. The initial output of the refinery will be on the basis of 15,000,000 pounds of refined nickel per annum, but the company, in the design of the plant and process equipment, have kept in view the possibility of this output being doubled or even quadrupled, within a few years.

The operating force, on the initial basis of 15,000,000 pounds of nickel per annum, will be about 400 men, and the company has reserved a site 300 feet deep by 4,000 feet long to provide for housing of employees. An attractive club house and recreation hall, and a large residential club for single men, are now in course of construction, but in view of the building of houses in the vicinity by local interests, the company has decided not to proceed with building of workmen's cottages until next year, at which time any requirements not arranged for will receive attention.

In operating the nickel refinery, a large number of products come into use, but apart from the large tonnage of copper-nickel matte, which will be supplied from Northern Ontario, there will be bituminous coal, coke, cordwood, fuel oil, nitre cake, charcoal, silica rock salt, soda ash, nitrate of soda, sulphuric acid, fire clay and fire brick, estimated annually at about 100,000 tons.

### USES OF NICKEL.

The Royal Ontario Nickel Commission report says in part: "Nickel steels and white metals, i.e., non-ferrous alloys containing nickel probably now use up to 90 per cent. of the total world production. They were largely and increasingly used before the war and, although war demands are mainly what may be described as temporary, they have emphasized the value of nickel, not only in steel but in cupro-nickel and other alloys, more highly than many years of active advertising propaganda would have done in times of peace. Those who are now using nickel steels in their manufactures for war purposes, or in their tools and machinery for producing the same, now appreciate the value of nickel steel, and will never go back to the use of the ordinary steel with which many of them were formerly satisfied except for very special purposes.

"The principal uses for nickel steel are those where increased strength or lightness without sacrifice of strength is required, i.e., where special tensile strength and elongation tests have to be passed. Such, for instance, are trusses and other strain-bearing parts in bridge building, etc., or rails where, as at curves, excessive wear and tear occur, or corrosion is likely to be excessive, or the cost of replacing rails is unusually heavy, as in railway tunnels. It is also largely used for special locomotive forgings, electric railway gears, marine and stationary engine works, and for an enormous variety of parts in automobiles, aeroplanes, etc. It is, in fact, employed for an infinity of purposes, including large castings and forgings such as crank shafts, but particularly the small parts of rapidly moving machinery which must be light but strong and resistant to shock. No special reference need be made to its use for ordnance, except to say that it is employed largely for armor-plate, large and small guns, gun shields and armor-piercing projectiles.

"Nickel for making steel is largely sold direct as commercially pure nickel, but sometimes in the form of an alloy with iron, and often with the addition of chromium, tungsten, molybdenum and other metals required in the ultimate composition of the steel. On this account, it is likely that the use of the electric furnace for the smelting of nickel ores and nickeliferous by-products will increase more rapidly in the future than it has done in the past.

"Ordinary nickel steels contain under 5 per cent. of nickel and commonly range near  $3\frac{1}{2}$  per cent., but highly nickeliferous steels carrying up to 40 per cent. nickel are used for special purposes where non-magnetic qualities, resistance to corrosion and above all, no expansion or contraction, or any desired expansion or contraction, with change of temperature, is important. These steels absolutely control the market for special purposes such as clock pendulums, measuring tapes and certain philosophical instruments, and, although the tonnage is small, it is a rapidly growing outlet for nickel. Such alloys are used in place of platinum as the leading-in wires for electric lamp bulbs, and for many other purposes where a metal having the same coefficient of expansion as another material is required."

Considerable quantities of nickel are used for plating other metals. Another important use is in nickel silver. As in the case of coinage these uses take small amounts compared with the use in making nickel steel.

The white, ductile triple alloys of copper, nickel and zinc, which are known commercially as nickel silver or German silver, are of somewhat widely varying composition, and are made in a number of different qualities, the most usual of which contain about 55 to 60 per cent. of copper, 15 to 20 per cent. of nickel, and 20 to 30 per cent. of zinc.

Nickel-chromium steel is the most important of the alloy steels used for structural purposes, as the tonnage used now far exceeds that of ordinary nickel steel.

### BUFF MUNRO.

Work is to be started soon on the Buff Munro mine, situated about a mile from the Croesus. Two shafts will be sunk and other development work carried on. Surface showings are said to indicate good prospects.



**THE CREIGHTON OREBODY.\***

By C. W. Knight.

The Creighton is the largest nickel mine which is being worked in the world, and, at the same time, one of the greatest metalliferous mines of any kind. There are said to be 10,000,000 tons of ore in the mine, estimated by actual workings and diamond drill.

The oldest rock in the vicinity of the Creighton is what has been called greenstone. It is generally coarse-grained and looks like a gabbro or diorite; there are also fine-grained facies of the rock. The coarse-grained greenstone resembles somewhat the norite, but it appears to be more decomposed than the norite and has a greener shade, the norite having a grey tint.

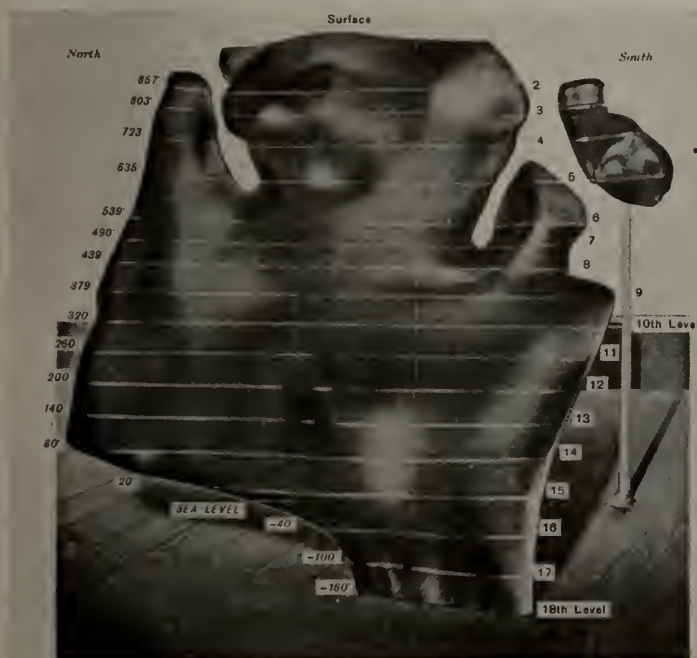
The eruption of the greenstone was followed by the great norite intrusion. That the norite is younger than the greenstone is shown by the fact that it has chilled against the latter. It also holds inclusions of the greenstone, one of these larger masses being shown on the map about 1,000 feet to the north of the open pit. Mineralogically and chemically, the composition of

the latter to some extent. Thus was the Creighton orebody formed.

After the formation of the orebody, fissures were formed in all of the rocks in the vicinity of the deposit, including the deposit itself, and dikes of trap were intruded into greenstone, norite, granite, and the orebody. Ore deposition had practically ceased before this took place, for the trap dikes are free from ore except for small veinlets along the edges. The dikes do not cut entirely across the ore-body, but appear to have penetrated it only a relatively short distance.

The final chapter in the history of this marvellous orebody was closed by the formation of another series of fissures through which were erupted coarse-grained olivine diabase dikes. These dikes cut the orebody and the trap dikes described in the previous paragraph. C. H. Hitchcock, of the Canadian Copper Company, first recognized these trap dikes as distinct in age from the later olivine diabase dikes.

The shape of the Creighton orebody is shown by a model constructed by officials of the Canadian Copper Company. The white, horizontal lines represent the



View of West Side.



View of South End.

**MODEL OF THE CREIGHTON OREBODY.**

the norite is very uniform for a distance of at least 3,250 feet northwestward from the Creighton pit.

After the norite had solidified, the granite mass, which occupies parts of Graham, Waters and Snider townships, was intruded. It broke its way through the crust of the earth along the norite-greenstone contact.

The next event, and the one which immediately preceded the formation of the Creighton orebody, was that which was represented by a period of tremendous crushing and brecciation along the norite-granite contact. A great crush-breccia and crush-conglomerate, of granite, greenstone and norite fragments, were formed.

A period of ore deposition closely followed the crushing and brecciation; and magmatic solutions, carrying sulphides, circulated upwards through the crushed rocks and deposited nickel, copper and iron sulphides in the spaces between the rock fragments, replacing

various levels, and the altitude of these levels above or below sea level are noted.

The upper part of the model was constructed from information obtained mainly from actual workings, while the lower part was outlined by means of information derived from diamond-drill cores. In July, 1916, there were but two crosscuts and no stopes in the orebody on the twelfth level. Three months later there were five crosscuts on this level and stoping had already begun. On the tenth and higher levels, however, the shape and extent of the deposit had been ascertained mostly from workings which consisted of crosscuts, drifts, and stopes.

From the model it is seen that the central part of the deposit is lenticular; that is to say, its length is much greater than its width, so that the ends "pinch" or taper out gradually. The upper and lower parts, on the other hand, are roughly oval in outline. It is further seen that its known depth is about twice its maxi-

\* Extracts from a report to the Ontario Nickel Commission.



imum length. Of course it is not possible to say how much of the deposit has been eroded during past geological ages. And it may also be noted that the depth to which the deposit goes has not yet been ascertained.

The orebody had a known depth of about 2,000 feet measured along its average dip of 45 deg., but the model only shows the orebody to a depth of about 1,600 feet measured along its dip. Diamond drilling ceased about this point, but the last drill cores still showed the presence of ore. The maximum length is about 1,000 feet. The width on the surface is about 180 feet. Between the fifth and sixth levels its width becomes abruptly less, so that on the sixth and eighth levels it has only a width of about 50 feet. Below the eighth level, however, it again becomes wider, and on the tenth it has increased to about 130 feet. Below this the diamond-drill cores show it to be even wider; in fact, wider than in the great open pit on the surface.

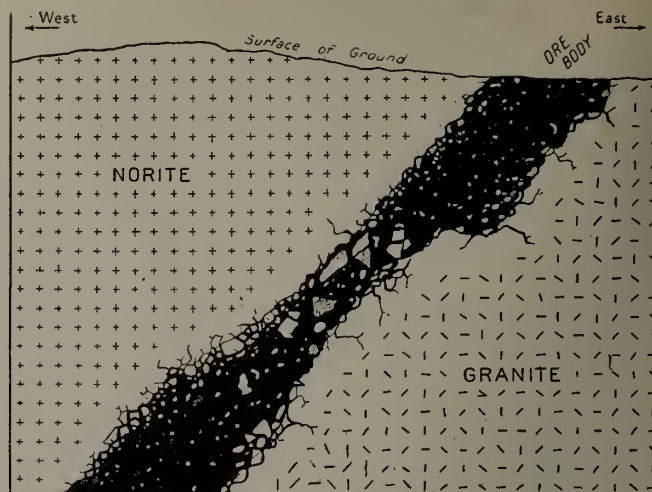
There is a small isolated orebody, near the surface, southward from the main ore. Its relative size and position are shown by the model.

The orebody occurs about at the contact between granite and norite, the latter forming the hanging-wall, the granite the footwall. It has been named a marginal deposit. The orebody, however, is found largely in the granite foot-wall, and it may be said that the limit of the commercial ore is met with when the norite hanging-wall is encountered. Sometimes, indeed, the commercial ore ends before the norite is met with, in which case massive granite forms not only the foot-wall but the hanging-wall. The strike of the orebody is about north and south—really a few degrees east of north. The exact strike on the third, fourth, fifth, sixth, eighth and tenth levels may be seen by consulting the composite plan facing page 144. The dip of the orebody is about 45 deg. to the westward, and there appears to be no change on the lowest parts of the deposit.

An examination of the stopes, crosscuts, drifts and other workings has shown that the orebody consists of a mass of rock fragments cemented together by sulphides. The hand-picked ore contains 4.44 per cent. of nickel and 1.56 per cent. of copper.

It is evident that the formation of the Creighton orebody was preceded by a period of tremendous brecciation and crushing along the contact of granite and norite. That this crushing took place largely in the footwall is shown by the fact that most of the rock fragments in the ore consist of granite and greenstone, while the norite fragments are confined mostly to the vicinity of the hanging-wall. In other words, the commercial orebody occurs in the granite footwall—not in the norite. Sometimes indeed the granite actually forms the hanging-wall as well as the footwall. Generally speaking, it may be stated that, when the norite hanging-wall is met with, the commercial ore comes more or less abruptly to an end.

In searching for an explanation of the origin of the Creighton orebody an observer is soon confronted with the fact that the gravity segregation theory does not appear to be a suitable one. It would seem that it is necessary to fall back on the time-honored theory of deposition from heated solutions. This theory requires little explanation. The crushed nature of the granite footwall and of part of the norite hanging-wall presented an ideal zone for the circulation of heated aqueous solutions. These solutions possibly carried little else than sulphides. It is supposed that they came from great depths, and nearer the surface the sulphides were precipitated, filling the spaces between



Ideal cross-section through Creighton orebody, from the surface to the proposed eighteenth level, showing the nature of the deposit. Black represents ore. The norite is "spotted" with "blebs" of ore, about the size of peas, for 2,000 feet beyond the orebody. This "spotted" norite is not indicated in the drawing except along the edges. The granite is also "spotted" with ore, but to a much less extent than the norite. While the commercial orebody occurs about at the contact of the norite and granite, nevertheless the commercial orebody is found largely in the granite footwall—not in the norite.

the fragments in the crush-breccia and crush-conglomerate. As might be expected, the hanging-wall and footwall and the fragments composing the crush-breccias and crush-conglomerates are more or less replaced or impregnated by sulphides.

### THOMAS FROOD'S DISCOVERY.

One of the early prospectors in the Sudbury region was Thomas Frood, who had been a wood ranger in the employ of the Crown Lands Department, and was familiar with the physical features of the Sudbury area. Mr. Frood relates that having heard from one William Nelson, a trapper, that there were indications of mineral on a creek in the northern portion of the township of McKim, he set out on 18th May, 1884, accompanied by A. James Cockburn, another prospector, to examine the locality. He succeeded in locating a vein of pyrites on lot 7 in the sixth concession, and traced it across the boundary to lot 6. A dispute afterwards arose between the two prospectors, which they settled by allotting lot 6 to Cockburn and lot 7 to Frood. Cockburn's claim was transferred to J. H. Metcalf and W. B. McAllister, in whose names the grant issued on 16th July, 1884. Frood took out the patent for the south half of lot 7 in the same month. The mine subsequently opened on this deposit, though not containing the richest ore, has proven to be the largest of the great ore bodies of Sudbury so far developed, and bears the name of Frood, who was a man of education and ability. It is also known as No. 3 mine of the Canadian Copper Company, which now owns the bulk of the deposit. Another of Thomas Frood's discoveries was the Copper Cliff mine, located in 1885.

The first discovery of nickel in Ontario was at the Wallace mine, a short distance west of the point where the Whitefish river enters Lake Huron. No orebody of any consequence has been found there, however.



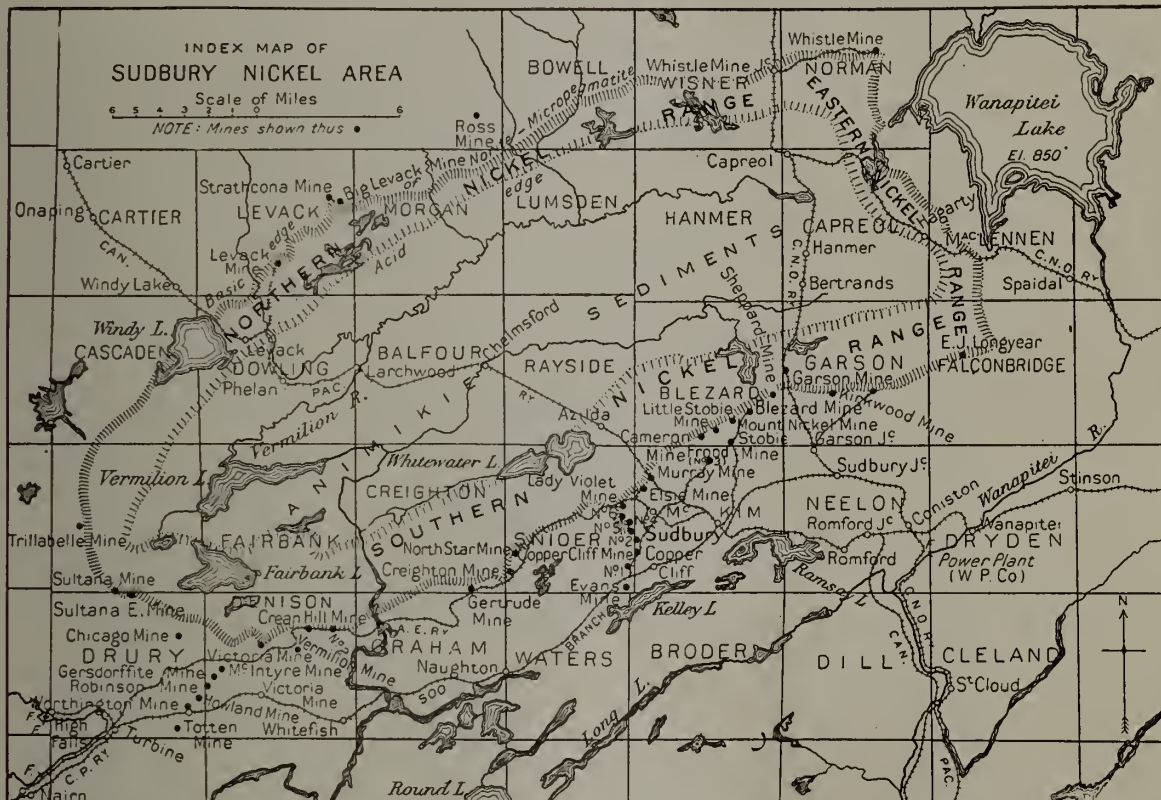
### THE MURRAY MINE.

The Nickel Commissioners in a historical sketch of nickel discoveries say of the Murray mine:

"The building of the railway through the Sudbury region in 1883 quickly led to the discovery that it was rich in minerals. The first deposit of nickel ore to be actually found was what afterwards came to be known as the Murray mine. The right of way for the railway was cleared for some distance west of Sudbury in 1883, and in August of that year a blacksmith on the construction gang named Thomas Flanagan observed an area on the right of way cov-

liam, then well-known merchants of Pembroke. The former was a member for several terms in the Legislature at Toronto, and also sat for Pontiac county, Que., in the House of Commons at Ottawa.

"The patentees sold to H. H. Vivian and Company, of Swansea, Wales, who began mining operations in October, 1889, after having tested the quality and character of the Sudbury ores by smelting and refining them in their Swansea works. A smelter was erected and blown in, September, 1890; a second furnace was added a year later, and a third in 1892. These made a low grade matte, containing about 8 per cent. of nickel, which was bessemerized to a product carrying 35 or 40 per cent. nickel and 20 to 25 per cent. copper.



Map of Sudbury Nickel Area.

ered with gossan, and dug some holes in it which showed copper sulphide. When the "grade" reached the spot, a cutting in the rock was necessary, which exposed the deposit. A little later, the attention of John Loughrin, of Mattawa, afterwards for years member of the Legislature for Nipissing, who had a contract for making ties on that section of the line, was attracted by a deposit of "red mud" on the wagon road close by, and by the appearance of mineral in the rock cut. Doubtless others afterwards remembered that they, too, had noted the peculiar appearance of the place. This led to an application being made to the Department of Crown Lands by Thomas Murray on 25th February, 1884, for permission to purchase the lot 11 in the fifth concession of the township of McKim. It was accordingly patented to himself, William Murray, Henry Abbott of Brockville, and John Loughrin, on the 1st of October, 1884, the price paid being the statutory one of one dollar an acre. The mine received its name from the Murray brothers, Thomas and Wil-

liam. Mining and smelting was carried on with more or less success until 1894, when the mine was permanently closed down. The property remained unworked until it was sold for \$75,000 to J. R. Booth, M. J. O'Brien and associates, who prospected it by the diamond drill, and were successful in discovering a very large tonnage of ore previously unknown—now placed at eight or nine millions of tons. Messrs. Booth and O'Brien in turn sold to the British America Nickel Corporation, Limited, which now owns and proposes to work the mine on an extensive scale.

### COLOSSUS GOLD MINES.

Another property in Munro Township is being opened up with bright prospects ahead. This is the property formerly known as the Maloof claims, recently purchased by Mr. A. G. C. Dinnick, 12 King Street East, Toronto, and now to be operated under the name of the Colossus Gold Mines Limited. The property comprises the four original Maloof claims and three other claims known as the Eby claims, all of which adjoin the Burton Vet on the south and west.



**MINING METHODS AT CREIGHTON.\***

By T. F. Sutherland.

The orebodies of the Sudbury district vary greatly in size, dip and configuration, and the methods of mining are dependent on these factors. The ores are essentially pyrrhotite, chalcopyrite and pentlandite. The enclosing rocks are hard, like the orebodies, and but little timbering is required. They comprise norite, greenstones, quartzites, greywackes and granites. The orebodies dip at angles of from 36 degrees to 90 degrees.

The problem of extracting the ore after the size and configuration of the orebody is known, is a simple one owing to the nature of the ores and the enclosing rocks. Elaborate systems of timbering, caving, slicing or filling do not have to be considered. Where large stopes are to be worked out, pillars are left, and the backs are kept arched while the ore is being removed. Afterwards the pillars are robbed.

Ore was first mined in the Sudbury district by the open-pit method. The surface material was stripped off; the gossan, and overburden, the latter averaging up to ten feet in depth, was removed, and the open-pit method of mining followed. The ore was handled by derricks at first. Later a shaft was sunk adjacent to the open pit in the footwall, and connections were made with the open-pit at different levels. The ore was trammed to the shaft and dumped directly into skips. By this method about 3,000,000 tons were taken from the Creighton. Properties mined by this method were the Evans, No. 2, No. 4, No. 5, No. 6, Frood, Stobie, Crean Hill, Kirkwood, North Star, Victoria, Blezard, Murray and Creighton. Of these the Creighton was the largest pit, being about 670 feet long, 180 feet wide, and 200 feet deep. As the Creighton orebody dips at an angle of about 45 degrees, it was necessary to remove a large tonnage of waste from the hanging-wall. When all the ore, that could economically and safely be mined by the open-pit method, was taken out, the shafts were sunk to lower levels and overhand methods of stoping were adopted, a floor being left below the open pit. Where the ore bodies were narrow, the drifts were timbered over and the ore broken on the timbers. In wide orebodies, dry-wall drifts were used and circular pillars left where necessary.

As the nickel industry grew, and increased tonnages were demanded, it became necessary to more thoroughly prospect the orebodies and plan the work so that a constant large tonnage could be produced. The method of prospecting the orebodies was by means of magnetic surveys and diamond drilling, the relative importance of these two methods being governed by local conditions at each property. In general it may be said that the magnetic survey serves only as an aid in locating an orebody. The prospecting is done by means of diamond drilling. Properties thoroughly drilled were the Frood and Creighton, of the Canadian Copper Company, the Levack, of the Mond Nickel Company, and the Murray, of the British America Nickel Corporation. In the latter property, for instance, the surface was divided into 200-ft. squares, and a vertical hole drilled at the corners of the squares. By this means the dip, strike, configuration, assay and tonnage are pretty thoroughly known before any ore is removed. This information is sufficient to enable the whole operation of mining the ore to be planned in advance. Power plants, hoisting and sorting arrangements, shafts and equipment are all planned for the most economical handling of certain tonnages.

The magnetic surveys are made by the companies themselves. The diamond drilling is done under contract by drill companies located in Sudbury. The price varies from \$2.75 to \$4.00 a foot, depending on the location and size of contract.

The Creighton orebody has a maximum length of about 1,000 feet, and has been proven to a depth of 2,000 feet measured along its dip, the present ore reserves amounting to about 10,000,000 tons. It dips to the west at an angle of about 45 degrees.

As mentioned before, a large tonnage was removed from this property by the open-pit method of mining, the ore being removed through a 3-compartment shaft sunk in the granite footwall at an angle of 59 degrees near the east end of the orebody. As the depth or workings increased, it became necessary to change from the open-pit method to underground mining.

A second shaft was therefore sunk in the footwall. This was a 4-compartment shaft comprising a manway, two skipways and a compartment for handling men and material. This shaft was sunk near the westerly end of the open pit, and was carried to a depth of 830 feet on an angle of 47 degrees. On the 6th and 10th levels of this shaft a Farrel jaw crusher, with a 30-in. x 42-in. opening, crushing to 6 inches is installed. These crushers are each driven by two 100-h.p. motors and discharge into storage pockets holding approximately 400 tons. The ore from the storage pocket passes into a measuring pocket at the loading station about 60 feet below the haulage level. By this method the skip is loaded in about 10 seconds and the time for a return trip from the 6th level loading station, including loading, is 1 $\frac{3}{4}$  minutes. The skips, 5-ton capacity, are operated in balance, the hoisting speed being about 1,100 ft. per minute. On the main haulage levels 4 $\frac{1}{2}$  and 5-ton storage-battery locomotives are used, hauling trains of four 56-cubic foot side-dumping steel cars, which are mechanically dumped at the crushers.

All the ore goes through these crushers, the ore from the upper level being passed down through ore-passes, which discharge into a crusher. Waste rock is handled through separate rock passes and storage pockets, which discharge into the skips 30 feet below the haulage levels.

A third shaft, known as No. 3, is being sunk in the footwall 145 feet southwest of No. 2. It dips at an angle of 55 degrees and is to be continued to the 16th level. This shaft measures 8 feet by 33 feet, and is divided into five compartments, which consist of a manway, two skip compartments, and two cage compartments. The shaft is concreted for a distance of 40 feet below the collar. The skip-track consists of 85-pound rails, resting on wall-plates, which in turn are supported on concrete piers. It is planned to place a crusher below the 14th level station with storage and measuring pockets of the same type as used in No. 2 shaft. Ore-passes will extend downward from the upper levels to this crusher. Skips of 8-ton capacity, hoisting in balance, are to be used. The hoist will have 12-foot drums and a rope speed of 2,500 feet per minute. Stations have been cut in this shaft at the 6th, 8th, 10th, 12th and 14th levels. The first three levels correspond with the similarly numbered levels from No. 2 shaft. The distance between levels is 150 feet measured along the incline. Intermediate or sub-levels are to be driven halfway between these main levels in the footwall and will be numbered 7, 9, 11 and 13. These sub-levels are necessary to remove the broken ore from the footwall owing to the low angle at which the orebody lies.

\* Extracts from a report to the Ontario Nickel Commission.

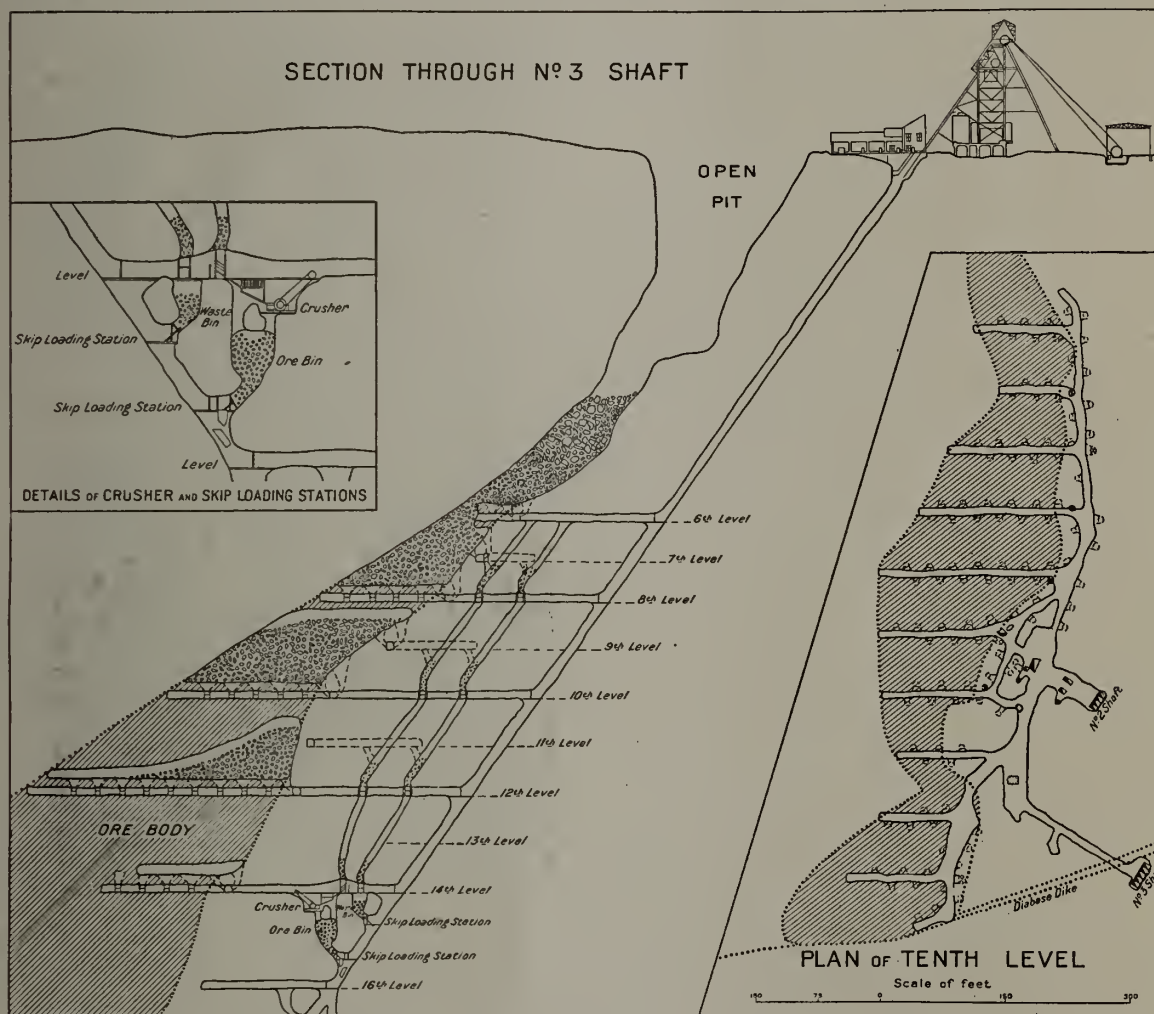


The main level stations are 25 feet wide and are cut in the footwall. The main drifts are driven in the footwall parallel to the orebody. Levels Nos. 6, 10, 12 and 14 and motor-haulage levels are driven 10 feet wide and 9 feet high, laid with 40-lb. rails and have  $\frac{1}{2}$  of 1 per cent. grade to the crusher station. The other levels are driven the ordinary size, 8 ft. by 8 ft., and are laid with 25-lb. rails, with a grade of  $\frac{2}{3}$  of 1 per cent. to the ore-passes which lead to the crusher on the first haulage level below. Rib pillars, 15 feet wide, are left every 75 feet approximately at right angles to the strike of the orebody. In these rib pillars crosscuts are driven from the main levels to the hanging side of the orebody. These crosscuts are carried on a  $\frac{2}{3}$  of 1 per cent. grade. This gives a series of parallel stopes

ried up along the footwall in the pillars and connected with the stopes every 25 feet. All pipe-lines, etc., are carried in these manways.

For development work  $3\frac{1}{8}$ -in. piston drills are used, and for stoping both piston and Leyner drills are employed, 8-ft. to 10-ft. holes being the rule. Block holers follow the big machines in the stopes. The drills are supplied with air at a pressure of 90 pounds and 40 per cent. forcite is used for all blasting operations.

In the rock house the skips dump over grizzlies and the coarse material is fed through 18-in. by 30-in. jaw crushers, which discharge upon travelling picking belts, where about 17 per cent. of waste material is removed by hand-picking. The ore falls into ore bins,



Sketch Showing Method of Mining Creighton Orebody.

60 feet wide traversing the orebody throughout its entire length. From each side of the crosscuts box holes are cut at 30-foot centres up into the stopes. As far as possible these box holes are staggered in the crosscuts and also as regards the stope. The box holes are carried up about 15 feet, then chambered out and stoping commenced. A 15-foot floor is left in the bottom of each stope. The chutes are  $4\frac{1}{2}$  feet wide and are built of 12-in. by 12-in. timbers. They are lined with 6-in. by 6-in. or 6-in. by 8-in. timber, the bottom sloping at an angle of 25 degrees, and protected by a  $\frac{1}{2}$ -in. steel plate. Formerly steel arc gates, air-operated, were used on the chutes, but these have been discarded and a stop log is now used.

In the stopes the shrinkage method of mining is followed. As soon as a stope is started manways are car-

ried up along the footwall in the pillars and connected with the stopes every 25 feet.

The equipment comprises the following: One Bellis and Morcom compressor, 2-stage, 42-in. and 25-in. by 21-in., 5,000-cubic foot capacity at 100 lbs. pressure and  $187\frac{1}{2}$  r.p.m., driven by a 900 k.v.a., 3-phase, 2,400-volt,  $187\frac{1}{2}$  r.p.m. auto-synchronous motor with a 22 k.w. 25 to 35-volt direct-connected exciter.

One Canadian Rand 1,600-cubic foot machine running at 120 r.p.m. with direct-connected motor drive. The cylinders are 25-in. diameter by 24-in. stroke and 16-in. diameter by 24-in. stroke. The motor is a 300-h.p. A.C.B., 125 r.p.m., 3-phase, 550-volt, 25 cycles.

One Canadian Rand 2,500-cubic foot machine, 2-stage, 17 inches and 28 inches by 24 inches, with inter-cooler and aftercooler, driven by a 425-h.p. Canadian



Westinghouse motor, 360 r.p.m., 550 volts, 3-phase, 25 cycles.

One Canadian Rand 2-stage compound, 1,200-cubic foot machine, 12 inches and 20 inches by 18 inches, driven by a 200-h.p. Crocker Wheeler motor, 500 r.p.m., 550 volts, 3-phase cycles.

Hoisting through No. 1 shaft is done by a 2-drum hoist of the Denver Engineering Works, motor-driven. The drums are 4-ft. 9-in. by 4-ft. 10-in. wide, with friction band brake. The hoisting speed is 500 feet per minute. The motor is a 150-h.p. A.C.B., 550 r.p.m., 550 volts, 3-phase, 25 cycles.

At No. 2 shaft ore is hoisted by a double-drum electric hoist, built by the Nordberg Manufacturing Company. The drums are 7-ft. diameter and 4-ft. face, using a  $1\frac{1}{8}$ -in. diameter rope. The hoist is equipped with parallel-motion post brakes operated by oil-thrust cylinders. The hoisting speed is 1,100 feet per minute with a 5-ton load of ore. The hoist is operated by a 350-h.p. 500-480 r.p.m., A.C.B., 25-cycle motor with limit switches positively geared to each drum.

The man-cage hoist at this shaft is one drum of a 3-drum hoist built by the Denver Engineering Works, driven by a 250-h.p., A.C.B., 500 r.p.m., 550 volts, 3-phase, 25-cycle motor, and equipped with both band and post brakes. The drum is 4-ft. 9-in. diameter by 4-ft. face. The hoisting speed is 690 feet per minute. At No. 3 shaft a Wellman Seaver Morgan Company double-drum electric hoist is in use temporarily during construction. The drums are 72-in. diameter by 48-in. face. The brake is a post brake air-operated. The hoisting speed is 800 feet per minute with a load of 11,700 lbs. The hoist is driven by an A.C.B., 250-h.p. motor 500-480 r.p.m., with limit switches and brake solenoids.

#### RINALDO McCONNELL'S DISCOVERY.

Among the early prospectors at Sudbury was Rinaldo McConnell, and in point of time his discovery of what was afterwards called by the Canadian Copper Company No. 4 mine, situated on the south half of lot 1 in the fourth concession of the township of Snider, was the second ore body to be located in the Sudbury area. McConnell on 16th May, 1884, applied on behalf of himself and Joseph Riopelle for this parcel and also for the southeast quarter of lot 2 adjoining, and the land was patented to them 25th July of the same year.

Rinaldo McConnell's connection with the Sudbury nickel region, begun at this early date, has continued until today. Physically robust and a man of energy and intelligence, Mr. McConnell in the capacity of prospector and middleman has played no small part in the development of the nickel-copper industry.

Late on the night of March 18th, or early in the morning of the 19th, robbers got away with gold to the value of about \$20,000, which they stole from the Chicagoff mine, Alaska.

It is stated that some fine copper ore has been shipped from the O. K. mine, Oroville, Washington, to the Granby Consolidated Co.'s smelting works at Grand Forks, B.C. A lot of 52 tons netted about \$1,500 after all charges had been deducted. The proportions of the value per ton were: Copper \$37.80, silver \$3.19, and gold \$1.80.

#### OBITUARY.

Mining men who knew Mr. A. C. Bailey of Cobalt were shocked to learn of his sudden death on March 21st, after an illness of only a few days. Mr. Bailey had lived for ten years in the Cobalt district and had made many friends there and throughout Ontario. An attack of pneumonia took him off with startling suddenness.

Mr. Bailey was born in Toronto in 1881, and lived there until 1886, when his parents moved to Sault Ste. Marie, Michigan. He received his early education at the "American Soo" and graduated from the Michi-



gan College of Mines in 1906. He had during his college days spent some time in mining work at the Canadian Soo and at Michipicoten.

Mr. Bailey at Cobalt managed the Abitibi Cobalt property. Later as manager of the Cobalt Townsite and consulting engineer of Casey Cobalt he brought these two properties to a profitable stage after others had failed. He was similarly successful in managing the Wettlaufer. Recently he had been in charge at the Casey-Seneca and Mercer.

In the ten years he resided at Cobalt, his sterling personal qualities endeared him to everyone with whom he was associated. Few equalled and none surpassed Mr. Bailey in the esteem of all those who knew him. It was significant of his kindly nature that he spoke ill of no one, and always saw the best in everyone. He had no enemies. In his professional work, he was distinguished by an unswerving loyalty to the interests he represented. Mr. Bailey's death is a distinct loss to the profession and a greater loss to his many warm personal friends. The place he held in their hearts can never be filled.—W. E. Segsworth.



**PERSONAL.**

Mr. W. E. Segsworth has resigned as managing director of Feldspars Limited.

Mr. D. L. H. Forbes has returned to Toronto from Chile.

Mr. C. M. Campbell, superintendent of the Granby Consolidated Co.'s big copper mines at Phoenix, Boundary district of British Columbia, was in Spokane, Washington, at the end of March, receiving special medical attention.

Mr. Henry C. Carlisle has been appointed superintendent for the Mandy Mining Co., with headquarters at The Pas, Manitoba. The Mandy company is a subsidiary of the Tonopah Mining Co., of Nevada.

Mr. J. J. Fingland, for some years practising assaying at Kaslo and other parts of West Kootenay, B.C., and latterly Provincial road superintendent in Kaslo district, has joined the staff of the Consolidated Mining and Smelting Company of Canada at Trail, B.C., where he will do laboratory work.

Mr. Alexander Smith, one of the owners of the Surprise mine, near Cody, Sloean district of British Columbia, has returned to Kaslo, Kootenay lake, from Toronto.

Mr. Thomas Graham, for five years chief inspector of mines for British Columbia, has resigned that office to accept the position of general superintendent for the Canadian Collieries (Dunsmuir), Limited, which has large collieries in Comox and Extension districts of Vancouver island, British Columbia.

Mr. Clyde A. Heller, of Philadelphia, Pa., president of the Tonopah-Belmont Development Co., last month visited the gold mine the Belmont Canadian Mines, Ltd., is developing at Surf Inlet, Princess Royal island, B.C. On his return journey he was accompanied as far as Prince Rupert by Mr. F. W. Holler, superintendent of the latter company.

Mr. A. Ikeda has returned to Ikeda bay, Moresby island, of the Queen Charlotte group, off the British Columbia coast, to continue work at the Ikeda copper mine in that locality.

Mr. R. P. Trimble, of the Great Ohio mine on Rocher Debole mountain, in Omineca mining division of British Columbia, has returned north from a visit to Portland, Oregon.

Mr. D. J. Williams, superintendent for the Rocher Debole Mining Company, has returned to the Skeena country from a trip to Seattle, Washington.

Mr. Oscar Lachmund, general manager, and Mr. F. S. Norcross, superintendent of mines, for the British Columbia Copper Co., left Greenwood, Boundary district of British Columbia last month for New York City to attend the annual meeting of shareholders in the company.

Special correspondence from Republic, Washington, to Mining and Scientific Press, San Francisco, includes the following. The demand for Republic siliceous ores is increasing and leads to the impression that considerable activity will result in that camp the coming summer. The Consolidated Mining and Smelting Co. of Trail, B.C., has had Mr. P. W. Racey here for ten days; he has sampled the Mountain Lion mine and is now sampling the Great Republic mine. For several months a deal has been on for the sale of the Republic mine, and experts believe in the probability of ore of at least good shipping grade being found below the deepest workings, now 731 feet lower than the outcrop. The rich ore shoot feathered out at a depth of about

625 feet. A winze follows the vein 125 feet below the No. 4 adit-level, and drifts both north and south on the 700-foot level follow the hanging wall, from which crosscuts were driven by the Republic Consolidated Gold Mining Co., but no payable ore was found at that depth. Mr. R. G. Edwards Leckie, who was then in charge, advocated the sinking of a vertical shaft to strike the hanging wall of the vein at a depth of about 1,000 feet. I think Mr. D. C. Jackling favored Mr. Leckie's view, but the company was short of funds at the time. Transportation and treatment charges by the Granby Company at Grand Forks, B.C., were then \$7.50 a ton, and the reduction of more than one-half of that expense is of itself a good reason for renewed activity in development in the mines of Republic camp.

**PROSPECTORS' CONVENTION AT PORT ARTHUR.**

Sudbury, April 2.—Plans are well forward for a prospectors' convention, to be held at Port Arthur, April 9th to 13th, under the auspices of the City Council and the Board of Trade.

The Bureau of Mines of the Department of Lands, Forests and Mines is giving all possible help to make the convention of practical value to the prospector, by sending an expert mineralogist to make demonstrations at the chemical laboratory of the Port Arthur Collegiate Institute.

Mr. A. G. Burrows was to have been the lecturer representing the department, but owing to serious illness his place will be taken by Prof. A. L. Parsons of Toronto University.

The subjects to be discussed at the evening sessions will be: "Staking out and recording claims," by J. W. Morgan, mining recorder for Port Arthur and district; "Phases of prospectors' work in land surveying," by S. E. Flook, D.L.S.; "Principles of geology," by Mr. J. Cross of McGill University; "Formations and surface indications," by Captain H. E. Knobel, M.E.; "Elementary tests and analyses," by Professor A. L. Parsons of Toronto University; "Mining policies and their bearings on our mineral resources," by Peter McKellar, F.R.S.

There will be a Board of Trade luncheon in honor of the government lecturer on Tuesday, April 10, and a dinner to wind up the convention on Friday, April 13.

The city councils and boards of trade of both Port Arthur and Fort William are helping to make the convention a success, and although the initiative has been taken by Port Arthur, Fort William citizens and officials are heartily responding. It is expected that prospectors and mining men from Kenora, Fort Frances and Rainy River will be at the convention.

There has been considerable activity in mining in this district during the last three months, and the coming months promise to be very busy in mining matters.

The Similkameen Star, Princeton, B.C., referring to published reports of a deal for the Voigt copper-mining properties, in Voigt's camp, about ten miles from Princeton, the purchase price having been stated as \$3,000,000, with \$8,000,000 or \$9,000,000 to be spent in construction of a railway to the properties and in their development, said: "The fact is the deal has not yet been closed, nor is it likely to be for a time yet. . . . However, there are hopeful indications that the deal will eventually be made."



## SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

While in some parts of the Province the lateness of the Spring is proving unfavorable to mineral production, chiefly owing to lack of power where water is largely depended on for driving machinery, the heavy snowfalls that have been experienced during the latter part of the winter promise an abundant water supply for washing gold-bearing gravels and for placer-mining uses generally.

Several metalliferous mining companies engaged in mining and ore reduction in the Province have declared dividends for the first quarter of the current year. These are the Consolidated Mining and Smelting Co.; the Granby Consolidated Mining, Smelting and Power Co.; the Hedley Gold Mining Co., and the Le Roi No. 2, Ltd. The respective totals of these dividend disbursements are as under:

|                                 |           |
|---------------------------------|-----------|
| Consolidated M. and S. Co. .... | \$260,445 |
| Granby Consolidated Co. ....    | 374,563   |
| Hedley Gold Mining Co. ....     | 60,000    |
| Le Roi No. 2, Ltd. ....         | 29,220    |

The Standard Silver-Lead Co.'s dividend for the quarter has not yet been ascertained.

The uncertainty as to the coke supply, now that the agreement with the Crowsnest district coal mine employees has terminated by effluxion of time, is causing much uneasiness. Unless sufficient coke shall be obtainable for the blast furnaces of the several smelting works in Kootenay and Boundary districts, it will not be practicable to continue ore production. While some men will continue to be employed in doing development work in mines where this can be done to advantage at this time, it is to be expected that the larger number of the miners will be discharged. A report from Rossland indicates that this has already resulted, the news printed being in effect that eighty men have already been laid off at the War Eagle and Centre Star mines in that camp. In any case, there is little inducement, under existing cost conditions, to continue mining ore from those mines, since its chief value is in gold, so it may well be left in the mines and effort be concentrated in extracting ore having a greater copper content, such as occurs in parts of the Consolidated Mining and Smelting Co.'s neighboring Le Roi mine, and to some extent in the Le Roi No. 2 company's Josie group, nearby.

**East Kootenay.**

Thirty men are employed in the St. Eugene lead-silver mine, near Moyie, owned by the Consolidated Mining and Smelting Co. The ruins of the concentrating mill, destroyed recently by fire, are being cleared up. Meanwhile fifteen to twenty families, nearly all recent arrivals, following the company's decision to again operate the concentrator, are anxiously waiting to learn whether or not the company will rebuild the mill at Moyie. Already, it is stated, forty men have removed to other places, there not being any work for them to do after the destruction of the mill.

From the Cranbrook Herald it is learned that reliable mining report says that the Dibble group of mines near Mouse creek in Fort Steele mining division has been leased to a strong syndicate in which Sir George Foster has a large share. Active mining operations will be commenced as soon as supplies shall have been got up to the property. The further statement is made that the Victor Silver Leaf Mining Co., working the Victor claims on Mouse creek, has found them well

worth developing, the ore encountered being "splendid." From good authority it comes that the company contemplates soon building a concentrator.

News from Calgary, Alberta, where representatives of the Western Coal Operators' Association and of District 18, United Mine Workers of America, have been negotiating for some time relative to the terms on which a new agreement between the parties shall be made, is not encouraging as March draws to a close. Press despatches state that the representatives of the miners demand what amounts to a 25 per cent. increase in wages and a 20 per cent. reduction in hours of labor. Another reported demand is that the miners shall be granted 38 holidays in the year instead of eight provided for under the old agreement. It is asked that every pay day be made a holiday and that the men be granted a week off during the hot weather in July. Notwithstanding that no agreement appears to be in sight at the time of writing, there is said to be a disposition on both sides to compromise

**West Kootenay.**

**Ainsworth.**—For two weeks in March ore receipts at Trail from mines in Ainsworth mining division were light, having been only 83 and 82 tons, respectively. The Bell mine, in Jackson basin, has been sending zinc ore to Trail, but other shipments are generally silver-lead ore, the shippers prior to the end of the first week in March having included the Bluebell, Highland, and Utica. No word has yet come concerning the Florence Mining Co.'s new concentrating mill, but it is likely shortness of water prevents sufficient electric power being generated for working the mill machinery, and probably there is also an inadequate quantity for milling purposes generally.

**Slocan.**—Water for operating concentrating mills is still short in the Slocan district. The Silverton correspondent of the Kaslo Kootenaiian states that lack of water continues to prevent a resumption of milling at the Galena Farm mine, and the Sandon correspondent states that those who are operating mills are waiting patiently for the Spring freshet to allow of more power being developed for the mills. There are three concentrating plants in the immediate neighborhood of Sandon, namely, those of the Ruth, Slocan Star and Surprise mines. In the vicinity of Slocan lake there are the mill at Roseberry, the Galena Farm and Standard mills, near Silverton, and the Hewitt mill, up Four Mile creek. Three others affected by the short supply of water are the Rambler-Cariboo mill, above Three Forks; the concentrator at Kaslo, and the Florence Mining Co.'s mill, near Ainsworth. Across the lake from Ainsworth, the New Canadian Metal Co.'s mill at Riondel, when conditions are favorable, concentrates lead ore from the Bluebell mine.

A small lot of ore, 37 tons, was recently received at Trail from the owners of the Surprise silver-lead-zinc mine, situated near the summit of the mountain above Cody, Slocan. This was the first ore received at the Consolidated Co.'s smelting works from that mine for about two and a half years. Ore production from the Surprise was curtailed when the Ivanhoe concentrating mill was destroyed by fire in the summer of 1915, at which time both silver-lead and zinc concentrates made from Surprise ore at that mill were shipped to the United States. For a while, in the latter part of 1915, the ore mined was concentrated at the Rambler-Cariboo Co.'s mill, distant from the mine six or seven miles,



but eventually production was suspended until, late in 1916, concentrating operations were commenced at the rebuilt Ivanhoe mill, Sandon. The Surprise mine is owned by Congressman William Kent, of Kentfield, Marin county, California, and Mr. Alex Smith, of Toronto, the latter having been in charge of development work for about twelve years until the mine was established on a producing basis.

Production of concentrates at the Slocan Star mill has been resumed. For some months the water supply has been short for power drills in the mine and the enlarged concentrating mill, but it is expected this difficulty will shortly be overcome, a new water-line having been put in. It is reported that some 70 tons of silver-lead concentrate of an average value of \$150 a ton, and 150 tons of zinc concentrate, worth about \$25 a ton, have been shipped lately.

#### **Vancouver Island.**

Mr. J. M. Savage has assumed charge, in the capacity of general manager of the affairs of the Canadian Collieries (Dunsmuir), Limited, operating the Extension and Comox collieries on Vancouver Island. Several years ago he was actively associated with Mr. John Arbuthnot, formerly of Winnipeg, Manitoba, in the business of the company known as the South Wellington Coal Mines, Ltd., afterward reorganized as the Pacific Coast Coal Mines, Ltd., and in the operation of the company's coal mines a few miles south of Nanaimo, V.I.

The Valdes Copper Co. has arranged to ship about 400 tons of ore from its property on Quadra island, of the Valdes group, situated on the east side of Discovery passage, between Vancouver island and the Mainland. Some time since the company let a contract for doing development work on some of its Copper Mountain group of ten mineral claims, and now sufficient ore has been opened to admit of shipments in bulk being made to the extent above indicated.

One of the Island metalliferous properties that is expected to benefit as a result of the intended early re-opening of the smelting works at Ladysmith, V.I., is the Blue Grouse mineral claim, Cowichan lake, Victoria mining division. The property is situated on the west side of the lake, about seven miles from the end of the railway and three-quarters of a mile back from the water, the elevation above the lake being 500 to 800 ft. One carload of ore was shipped to the Trail smelter last January for test purposes; recently two cars were shipped to Ladysmith, and it is intended to get out about two cars a week. The ore is taken from a big open cut; it runs from 5 to 8 per cent. copper. It is hauled down to the lakeside and taken thence to the railway terminus in a scow. The expectation is that when the snow shall have melted, and the smelting works be in operation, the output of ore will be increased.

The Canadian Collieries (Dunsmuir), Limited, is building more coke ovens at Union bay, V.I., where are situated the company's bunkers and shipping wharves for coal from the several mines of its Comox colliery, a coal-washery, and a brickyard for making fire-brick. The existing 100 ovens were built in 1895-6, and thereafter up till 1911 coke was made in them. Following the closing of the Tyee Copper Co.'s smelting works in the last-mentioned year, coke-making ceased until the latter part of 1915, when a contract was entered into to supply coke for the Granby Consolidated Co.'s new smelting works at Anyox, Observatory inlet. By the end of 1915 the output of coke for that year was 5450 long tons, and for 1916 it was 28,044 tons. Now that smelting is to be resumed at Ladysmith, provision is being made, by building additional ovens, to meet the increased demand for coke for the blast furnaces.

### **NORTHERN ONTARIO.**

#### **Elliott-Kirkland.**

The extension of the power line from the Teck-Hughes to the Elliott-Kirkland Mines is now completed, resulting in development work at the latter property being greatly facilitated. At present the main shaft at the Elliott-Kirkland has reached a depth of ninety feet, and will be carried to the 125-ft. level, where a crosscut will be run in an endeavor to encounter the Kirkland Lake gold vein, which was located on the property near the western boundary of the Kirkland Lake Gold, where, however, the low-lying nature of the ground made it impossible to sink a shaft from the surface. It is anticipated that very little difficulty will be encountered in locating the vein at depth on the Elliott-Kirkland, owing to results obtained on the Kirkland Lake Gold, where the working on the same vein has reached a depth of 500 ft.

#### **Boston Creek.**

The recent spring weather has brought a decided feeling of optimism to the Boston Creek gold district, where growing faith is being exhibited by prominent mining men. At present among the properties in this section which are receiving more or less attention, with very favorable results, are: The Boston Creek, R. A. P. Syndicate, O'Donald, Boston, Hollinger, Miller-Independence, Gold Leaf, McRae, Hill and Currie properties. A number of important discoveries have been made and it is understood some diamond drilling will be done on a number of the properties this spring and summer. The O'Donald claims are under option by the Crown Reserve Mining Company of Cobalt, and the McRae claims were purchased by strong Montreal financial interests a short time ago, and active development work will be proceeded with on these in a very short time on an extensive scale.

#### **Staking in Thackeray.**

Free gold was found in a vein from five to seven feet in width in the Township of Thackeray late last fall, with the result that about forty claims were staked in this vicinity and a number of very promising veins are awaiting the disappearance of the snow when further exploration work will be undertaken. The scene of the new discovery is about twelve miles north of the Townships of Teck and Lebel, in which are located the Kirkland Lake gold area. The formation is Keewatin, and the veins are said to contain some molybdenum. There are two trails leading into the township. The shortest one is from Scottish Springs at Mileage 188 on the T. & N. O., a distance of about twelve miles; eight of which can be traversed by canoe in the summer time. The other route is by trail north-east from Bourke's Siding, a distance of about seventeen miles.

#### **Elk Lake.**

The Taylor property in the McKenzie Lake section of the Elk Lake district has closed down. It was generally understood that the company were starting on an extensive development program and the news that the work was being discontinued came as a big surprise. Financial difficulties was given as the reason for the shutting down of the property, and it is not definitely known when operations will be resumed.

#### **Larder Lake.**

Work on the Larder Lake Goldfields property at Larder Lake is being energetically pushed at the 300-ft. level and the vein at this point is said to be well mineralized and carries considerable free gold. Among the other properties in this district which are contemplating opening up in the near future are the Larder Lake Combine on Larder Lake, and the Lincoln-Nipissing in Skead Township. One reason for the



increased activity in this section is the fact that the addition to the power plant at Little Windigo is being pushed to completion and when it is completed, the power question for a number of these properties will be satisfactorily solved and development made a great deal easier.

#### **Newray.**

It is expected that the crosscut at the 400-ft. level of the Newray will encounter the Anchor vein almost any round now, as, according to the diamond drilling operations in which it was located, the drift is very close to it now. An extensive plan of diamond drilling on the property is being carried out and it is understood more than ordinarily good results are being obtained. The south-west corner of the Newray touches the north-east corner of the Plenaurum, and is in direct line with the strike of the vein systems of the Hollinger and McIntyre mines. It is the intention of the management to start up the small stamp mill on the property before the end of the present month, and if satisfactory results are encountered an enlargement of this will be made in a short time.

#### **McIntyre.**

The capacity of the McIntyre Porcupine mill has been brought up to 600 tons per day and the mill is running almost to the limit of its capacity, with the result that a decided improvement is expected in the tonnage milled and the recovery made. The grade of ore being sent to the mill is said to average around \$10.50 per ton. The figures for the past month are not up to expectation, but April will probably be a record-breaking period for this property. McIntyre seems at last to be striking her proper stride.

#### **Colossus Gold.**

The Colossus Gold Mining Company in Munro Township, less than one mile from the famous Croesus Mines, have let a large diamond drilling contract with the intention of proving the values at depth in a series of veins which carried good values on the surface. The claims of this company are 280 acres in extent and were formerly owned by Messrs. Malouf and Carter. Lumber for camp buildings has been ordered and the work of diamond drilling will be commenced before the end of the present month.

#### **Kenabeek and Hitchcock.**

The consolidation of the Kenabeek Mine and the Hitchcock veteran claim has been consummated and work on this new consolidation of properties will be energetically pursued. At the present time the shaft on the Kenabeek property has reached a depth of 120 ft. and a small vein carrying high grade silver values is showing at this depth. It is the intention of the company to continue the working to the 125-ft. level and then run a crosscut to encounter the parallel veins which were encountered on the surface of the property.

#### **Silverado.**

Machinery and supplies have been taken in over the winter road to the Silverado property at Gowganda and an extensive development program will be carried out this spring and summer. A seven-drill compressor and 100-h.p. boiler, together with other accessories for sinking the shaft and drifting were taken in. Considerable development work was accomplished last summer, and a number of promising veins encountered on the surface. Some sinking was done by hand steel, but late in the fall this was discontinued. This work will be resumed after the installation of the new plant and the veins discovered on the surface will be tapped at depth. The property lies along the Hudson Bay

Mining Company's property, on which a considerable amount of good ore has been discovered.

#### **Kirkland Lake Gold.**

It is stated on reliable authority that the Kirkland Lake Gold Mines, Limited, which has now reached a depth of 600 ft., will continue the main shaft to the 1,000-ft. level, establishing a station at every one hundred feet. This will be by far the deepest working in the Kirkland Lake camp. It is also reported that the company is planning the installation of a mill similar to the one which is giving such good results on the Schumacher property.

#### **Slade-Forbes Asbestos.**

The Slade-Forbes Asbestos Company, in Deloro Township, about three miles from Timmins, is meeting with considerable success in the development of claims. A short time ago a shipment of one ton of ore was made to Cincinnati. The product is sorted on cobbing tables and bagged and shipped. The shipment was valued at \$600. It is said the company intend installing a mill to treat the ore on the property in the near future.

#### **Sylvanite.**

Work has been commenced on the Sylvanite Company's property at Kirkland Lake and the contract has been let for 75 feet of sinking. This property has an up-to-date electrically driven plant and is located between the Tough-Oakes and the Wright Hargraves. A number of promising veins, some carrying free gold, have been uncovered in surface work, and will now be developed to depth.

#### **Dome.**

Driving east on the big drift at the 700-ft. level of the Dome Mines, the miners have crossed the line of the Dome Extension property and are now about 200 feet in on the latter property, on which Dome has an option. Considerable diamond drilling has been done on the Dome Extension and a large quantity of ore has been located. It is expected that the next annual report of the Dome Mines will contain a statement regarding developments on the Dome Extension.

#### **Porcupine Crown.**

The Porcupine Crown mining company is testing the property to a depth of 2,000 ft. by the aid of a diamond drill. Additional hoisting apparatus has been installed in the winze below the 500-ft. level, making it more economical to mine at this depth than heretofore.

#### **Moneta.**

It is reported that the Moneta Porcupine Mines, Ltd., will re-open in the near future. This property is located adjacent to the Miller-Middleton claims of the Hollinger-Consolidated and is comprised of three 40-acre claims, on which results were very encouraging in the limited amount of development work done.

#### **Pittsburg-Lorrain.**

Diamond drilling on the Pittsburg-Lorrain in South Lorrain is now under way, one hole being down around 500 ft. at the present time. It is the intention of the company to put down a number of holes to the eight or nine hundred foot depth, which will be the deepest point ever reached by diamond drilling operations in this district. A vein of calcite has been discovered in crosscutting around the 200-ft. level, and is being drifted on. This vein is about five inches in width and while it was not found to contain silver values, it is the hope of the management that better results will be encountered before much further work is done.

#### **Temiskaming.**

The shaft on the Temiskaming has reached a depth of 1,600 ft., and the working at this level has been



connected up with the Beaver, thus creating a better ventilation system for both the properties at this level. It is understood that developments on the winze at the 1,600-ft. level of the Beaver are very satisfactory. It is the intention of the Temiskaming to sink to the 1,800-ft. level before undertaking much development work, but when this level is reached much crosscutting and drifting will be done on any veins which the management encounter. It is highly probable the same vein system encountered on the Beaver will extend to the Temiskaming.

#### Ophir.

On the 300-ft. level of the Ophir mines at Cobalt, a crosscut six hundred feet in length has cut ten separate veins and is now very close to the Diabase-Keewatin contact. None of the veins so far encountered have been found to contain any great amount of silver, although they are all very strong and well defined and give promise of better results with more development work. Much interest centres in the work going on at No. 2 shaft at the 410-ft. level, where the large vein should be encountered any day now, and the result of this work is being watched with interest.

#### Adanac.

A new vein has been encountered in the crosscut on the 400-ft. level of the Adanac mine at Cobalt. A small amount of native silver is in evidence in the vein and drifting will be continued in an endeavor to locate more extensive deposits of the precious metal. The crosscut has been in the diabase below the contact and the broken-up nature of the last vein tapped, would lead to the belief that the contact is only a few feet above the drift. It is the intention of the management to raise on all the promising veins as it is expected ore of a commercial value will be found to exist in the overlying Keewatin. The crosscut is to be continued further west at an early date.

#### McKinley-Darragh.

The McKinley-Darragh mine at Cobalt intends installing a second flotation plant with a capacity of 200 tons per day, to treat the tailings from previous operations. The tails will be reground in a Marathon mill, which will be the first of its kind to be installed in the Cobalt camp; the mill is 4 x 8 ft. and a series of steel rods is used for the grinding process instead of balls or pebbles. The machinery has been ordered and the new building is being constructed. After grinding in the new mill the ore will be treated by the Callow flotation process. The installation of the new plant will bring the treatment of tailings up to 400 tons per day, just double the present capacity.

#### Calumet and Montana.

A two-inch vein has been found on the old Airgoid property, leased to the Calumet and Montana company, near the Dominion Mines line. Promising silver values are in evidence in the vein and it is being drifted on in the hope of encountering better values. The vein is supposed to be an extension of one of those located on the property of the Dominion Mines.

#### Green-Meehan.

A movement is on foot to recommence operations at the Green-Meehan property. A earload of ore will be shipped from the dump to one of the customs mills at Cobalt and if the returns are satisfactory it is understood the several thousand tons of ore on the dump will be treated, and the mine dewatered again.

#### Hargraves.

An ore shoot on the 375-ft. level of the Hargraves mine is proving very consistent and considerable ore

is being taken out. Shipments are being made from the dump to the Dominion Reduction mill and it is said a fair amount of profit from this source is being shown.

#### Murray-Mogridge.

Work on the Murray-Mogridge at Wolfe Lake, three miles from Bourke's Siding, is progressing satisfactorily by the use of hand steel, pending the arrival of the machinery which is expected to arrive any day now. A complete plant is being installed. The shaft has been sunk to a depth of sixty feet and the vein has been tapped at intervals. It is understood results look very promising.

The Sullivan Machinery Co., Ltd., of Canada, will remove its office on or about that date from Shaughnessy Building, Montreal, to No. 37 Colborne Street, Toronto. Air compressors, rock drills, hammer drills, and their parts will be carried in stock. The company announces that: "This change is made on account of the improved service we expect to give our Canadian patrons from Toronto, which seems to be more central than Montreal for our business."

Mr. Herbert C. Hoover, who has been in charge of Belgian relief work in London, will be asked by Council of National Defence to return to United States and take chairmanship of a committee on food supply and prices.

The Washington, D.C., correspondent of the Engineering and Mining Journal lately wrote: "There is a movement on foot to put the United States Bureau of Mines in the Department of Labor, removing it from the Department of the Interior, where it has always been. This would probably totally destroy its usefulness and would result eventually in decay of the organization, not through any fault of the Bureau, but because it would be placed in such an attitude to the mining business that it could not expect to receive the support and co-operation extended to it now."

The Daily Alaskan, Skagway, said on March 15: Locally, conditions have never been more favorable than at present. All the big mining industries in the vicinity and contiguous to the vicinity are working full time and employing practically all-comers, and will continue to do so until the time comes when the demand for labor will have been met, and it is doubtful if that condition will be reached this year.

#### SILVER PRICES.

|             | New York. | London. |
|-------------|-----------|---------|
|             | cents.    | pence.  |
| March—      |           |         |
| 21. . . . . | 72¼       | 35⅞     |
| 22. . . . . | 72¼       | 35⅞     |
| 23. . . . . | 72½       | 35⅞     |
| 24. . . . . | 71⅞       | 35¾     |
| 26. . . . . | 71⅞       | 35¾     |
| 27. . . . . | 71¾       | 35⅞     |
| 28. . . . . | 72⅝       | 36¼     |
| 29. . . . . | 72⅝       | 35⅞     |
| 30. . . . . | 72⅝       | 36      |
| April—      |           |         |
| 2. . . . .  | 74⅞       | 36⅞     |
| 3. . . . .  | 74⅞       | 36⅞     |
| 4. . . . .  | 74        | 36¾     |
| 5. . . . .  | 73¾       | 36⅝     |

## MARKETS

## TORONTO MARKETS.

|                                                            |
|------------------------------------------------------------|
| Cobalt oxide, black, \$1.05 per lb.                        |
| Cobalt oxide, grey, \$1.15 per lb.                         |
| Cobalt metal, \$1.25 to \$1.50 per lb.                     |
| Cobalt anodes, \$1.50 to \$1.75 per lb.                    |
| Nickel metal, 45 to 50 cents per lb.                       |
| White arsenic, 5½ to 6 cents per lb.                       |
| April 10, 1917—(Quotations from Canada Metal Co., Toronto) |
| Spelter, 14 cents per lb.                                  |
| Lead, 12¼ cents per lb.                                    |
| Tin, 58 cents per lb.                                      |
| Antimony, 36 cents per lb.                                 |
| Copper, casting, 37 cents per lb.                          |
| Electrolytic, 39½ cents per lb.                            |
| Ingot brass, yellow, 23 cents; red, 25½ cents per lb.      |
| April 10, 1917—(Quotations from Elias Rogers Co., Toronto) |
| Coal, anthracite, \$9.00 per ton.                          |
| Coal, bituminous, nominal, \$8.50.                         |

## NEW YORK MARKETS.

|                                                         |
|---------------------------------------------------------|
| Connellsville coke—                                     |
| Furnace, spot, \$8.00.                                  |
| Contract (nominal), \$7.00 to \$8.50.                   |
| Foundry, spot, \$10.00.                                 |
| Contract, \$8.50 to \$9.00.                             |
| Straits Tin, spot, f.o.b., nominal, 54.75 cents.        |
| Copper—                                                 |
| Prime Lake, nominal, 34.00 to 34.50 cents.              |
| Electrolytic, nominal, 33.75 to 34.25 cents.            |
| Casting, nominal, 30.75 to 31.25 cents.                 |
| Lead, Trust price, 9.00 cents.                          |
| Lead, outside, nominal, 9.25 to 9.50 cents              |
| Spelter, prompt western shipment, 10.30 to 10.55 cents. |
| Antimony—Chinese and Japanese, nominal, 36.00 cents.    |
| Aluminum—nominal—                                       |
| No. 1 Virgin 98-99 per cent., 59.00 to 61.00 cents.     |
| Pure, 98-99 per cent., remelt, 55.00 to 57.00 cents.    |
| No. 12 alloy remelt, 39.00 to 41.00 cents.              |
| Powdered aluminum, 85.00 to 90.00 cents.                |
| Metallic magnesium—99 per cent. plus, \$3.00 to \$3.50. |

## STOCK QUOTATIONS.

-As of close April 9, 1917.

(By courtesy of J. P. Bickell &amp; Co., Toronto.)

## New York Curb.

|                            | Bid. | Asked. |
|----------------------------|------|--------|
| Boston & Montana .....     | .60  | .63    |
| Butte-Detroit Copper ..... | .62  | .75    |
| Canada Copper .....        | 1.81 | 1.87   |

|                             |       |       |
|-----------------------------|-------|-------|
| Dome Extension .....        | .20   | .22   |
| Hargraves. . . . .          | .16   | .18   |
| Inter. Petroleum .....      | 14.25 | 14.50 |
| Kerr Lake .....             | 4.25  | 4.50  |
| La Rose Con. ....           | .50   | .62   |
| McIntyre. . . . .           | 1.81  | 1.87  |
| N. Amer. Pulp & Paper ..... | 5.00  | 5.25  |
| Nipissing. . . . .          | 7.75  | 8.00  |
| Superstition. . . . .       | .35   | .37   |
| Temiskaming. . . . .        | .50   | .52   |
| Vipond. . . . .             | .45   | .50   |

## Ontario Gold Stocks.

|                          | Bid.  | Asked. |
|--------------------------|-------|--------|
| Apex. . . . .            | .08½  | .08¾   |
| Boston Creek .....       | 1.02  | 1.06   |
| Dome Extension .....     | .21½  | .21¼   |
| Dome Lake .....          | .19   | .20    |
| Dome Mines .....         | 17.00 | 18.00  |
| Hollinger Cons. ....     | 5.20  | 5.30   |
| Jupiter. . . . .         | .30   | ....   |
| McIntyre. . . . .        | 1.83  | 1.84   |
| Moneta. . . . .          | .12   | .12½   |
| Newray. . . . .          | 1.36  | 1.38   |
| Porcupine Crown .....    | .63   | .64    |
| Porcupine Imperial ..... | .03½  | .03½   |
| Porcupine Tisdale .....  | .01⅞  | .02    |
| Vipond. . . . .          | .46½  | .47    |
| Preston E. D. ....       | .04⅞  | .05    |
| Teck-Hughes. . . . .     | .68   | .71    |
| West Dome. . . . .       | .27½  | .28    |

## Cobalt.

|                                  | Bid.  | Asked. |
|----------------------------------|-------|--------|
| Adanac. . . . .                  | ....  | .20    |
| Bailey. . . . .                  | .05½  | .06    |
| Beaver Con. ....                 | .39½  | .41    |
| Chambers-Ferland . . . . .       | .13   | .13¼   |
| Coniagas. . . . .                | 3.60  | ....   |
| Crown Reserve .....              | .33   | .34½   |
| Great Northern .....             | .13   | ....   |
| Hargraves. . . . .               | .17¼  | .17½   |
| Hudson Bay .....                 | 40.00 | ....   |
| Kerr Lake .....                  | 4.30  | 4.50   |
| La Rose .....                    | .50   | .55    |
| McKinley-Darragh-Savage. . . . . | .48   | ....   |
| Nipissing. . . . .               | 7.80  | 8.00   |
| Peterson Lake .....              | .11¼  | .11¾   |
| Shamrock Cons. ....              | .22   | .23    |
| Temiskaming. . . . .             | .50   | .50½   |
| Trethewey. . . . .               | .16½  | .17½   |
| Wettlaufer. . . . .              | .07   | .08½   |

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The Company continues the notice of the former owners of these patents that it is ready to grant licenses for the use of this process to those who wish to install and use it in Canada, as well as in other parts of North America.

Notice is hereby given that suit will be brought against infringers to restrain all unlicensed use of the process and to recover all profits acquired by such unlawful use.

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Lead Residues and Copper Residues.

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## FORCITE

For hard rock mining--wet or dry  
*Less fumes than any other explosive 35 % to 75%  
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|-------------------|------------|-----------|----------|--------------|---|---------------|
| NOVA SCOTIA:      | -          | -         | -        | -            | - | Halifax       |
| QUEBEC:           | -          | -         | -        | -            | - | Montreal      |
| ONTARIO:          | Toronto,   | Cobalt,   | Timmins, | Port Arthur, | - | Ottawa        |
| MANITOBA:         | -          | -         | -        | -            | - | Winnipeg      |
| ALBERTA:          | -          | -         | -        | -            | - | Edmonton      |
| BRITISH COLUMBIA: | Vancouver, | Victoria, | Nelson,  | -            | - | Prince Rupert |

### Factories at

|                  |                    |                     |
|------------------|--------------------|---------------------|
| Beloeil, P.Q.    | Vaudreuil, P.Q.    | Windsor Mills, P.Q. |
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| Northfield, B.C. | Bowen Island, B.C. | Parry Sound, Ont.   |



# The Canadian Miners' Buying Directory.

- Air Hoists—**  
Canadian Ingersoll-Rand Co., Ltd.
- Amalgamators—**  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Antimony**  
Canada Metal Co., Ltd.
- Assayers and Chemists—**  
Milton L. Hersey Co., Ltd.  
Campbell & Deyell, Cobalt  
Ledoux & Co., 99 John St., New York  
Thos. Heys & Son.  
C. L. Constant Co.
- Assayers' and Chemists Supplies—**  
C. L. Berger & Sons, 37 William St., Boston, Mass.  
Lymans, Ltd., Montreal, Que.  
Stanley, W. F. & Co., Ltd.
- Babbitt Metals**  
Canada Metal Co., Ltd.  
Can. Fairbanks-Morse Co.
- Ball Mills—**  
Fraser & Chalmers of Canada, Limited.  
Hull Iron & Steel Foundries, Ltd.
- Belt—Leather, Rubber and Cotton—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Belt—Leather, Rubber and Cotton—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Blasting Batteries and Supplies—**  
Can. Ingersoll-Rand Co., Ltd.  
Curtis & Harvey (Canada) Ltd.  
Northern Canada Supply Co.  
Canadian Explosives, Limited
- Blowers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Boilers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.
- Boxes, Cable Junction—**  
Standard Underground Cable Co. of Can., Ltd.
- Buckets—**  
Can. Fairbanks-Morse Co.  
Hendrick Mfg. Co.  
M. Beatty & Sons, Ltd.  
Northern Canada Supply Co.
- Cable—Aerial and Underground—**  
Fraser & Chalmers of Canada, Ltd.  
Northern Canada Supply Co.  
Standard Underground Cable Co. of Can., Ltd.
- Cableways—**  
Fraser & Chalmers of Canada, Limited.  
M. Beatty & Sons, Ltd.
- Cages—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cables—Wire—**  
Standard Underground Cable Co. of Canada, Ltd.
- Car Dumps—**  
Sullivan Machinery Co.
- Cars—**  
Can. Fairbanks-Morse Co.  
W. Fraser.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cement Machinery—**  
Northern Canada Supply Co.  
Hull Iron & Steel Foundries, Ltd.
- Chains—**  
Can. Fairbanks-Morse Co.  
Jeffrey Mfg. Co.  
Jones & Glassco  
Northern Canada Supply Co.  
B. Greening Wire Co., Ltd.
- Chemists**  
Canadian Laboratories.  
Campbell & Deyell.  
Thos. Heys & Sons.  
Milton Hersey Co.  
Ledoux & Co.
- Coal—**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters—**  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Dock Bridges—**  
Roberts & Schaefer Co.
- Coal Mining Explosives—**  
Curtis & Harvey (Can.), Ltd.  
Canadian Explosives, Limited
- Coal Mining Machinery—**  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.  
Sullivan Machinery Co.
- Coal Pick Machines—**  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Washeries—**  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.
- Coaling Stations—**  
Roberts & Schaefer Co.
- Compressors—Air—**  
Can. Fairbanks-Morse Co.  
Darling Bros., Ltd.  
Escher Wyss & Co.  
W. Fraser.  
Smart-Turner Machine Co.  
Fraser & Chalmers of Canada, Limited.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Concentrators and Jigs—**  
Fraser & Chalmers of Canada, Limited.
- Concrete Mixers—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Wettlaufer Bros.
- Condensers—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.
- Converters—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Conveyor—Trough—Belt—**  
Can. Fairbanks-Morse Co.  
Jeffrey Mfg. Co.  
Hendrick Mfg. Co.
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Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
M. Beatty & Sons, Ltd.
- Crane Ropes—**  
Allan, Whyte & Co.  
B. Greening Wire Co., Ltd.
- Grinding Plates—**  
Hull Iron & Steel Foundries, Ltd.
- Crushers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Lymans, Ltd.  
Jeffrey Mfg. Co.  
Mussens, Limited.  
Hull Iron & Steel Foundries, Ltd.  
Wettlaufer Bros.
- Cyanide Plants—**  
Fraser & Chalmers of Canada, Limited.  
Roessler & Hasslacher.
- Derricks—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.
- Diamond Drill Contractors—**  
Diamond Drill Contracting Co.  
Smith and Travers.  
Sullivan Machinery Co.
- Dredger Pans—**  
Armstrong, Whitworth of Can., Ltd.
- Dredging Machinery—**  
M. Beatty & Sons.
- Dredging Ropes—**  
Allan, Whyte & Co.  
Fraser & Chalmers of Canada, Limited.
- Drills, Air and Hammer—**  
Can. Ingersoll-Rand Co., Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drills—Core—**  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.  
Sullivan Machinery Co.
- Drills—Diamond—**  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drill Steel—Mining—**  
Armstrong, Whitworth of Can., Ltd.
- Drill Steel Sharpeners—**  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Sullivan Machinery Co.
- Drills—Electric—**  
Can. Ingersoll-Rand Co., Ltd.  
Sullivan Machinery Co.
- Drills—High Speed and Carbon—**  
Armstrong, Whitworth of Can., Ltd.  
Can. Fairbanks-Morse Co.
- Dynamite—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Ejectors—**  
Can. Fairbanks-Morse Co.  
Darling Bros., Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Elevators—**  
Darling Bros., Ltd.  
Jeffrey Mfg. Co.  
M. Beatty & Sons.  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Wettlaufer Bros.
- Engineering Instruments—**  
C. L. Berger & Sons.
- Engineers and Contractors—**  
Fraser & Chalmers of Canada, Limited.  
Roberts & Schaefer Co.  
Foundation Co., Ltd. of Montreal
- Engines—Automatic—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
- Engines—Gas and Gasoline**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Alex. Fleck.  
Sullivan Machinery Co.  
Smart-Turner Machine Co.
- Engines—Haulage—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Can. Ingersoll-Rand Co., Ltd.
- Engines—Marine—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
- Engines—Steam—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
M. Beatty & Sons.
- Fans—Ventilating—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.
- Feeders—Ore—**  
Fraser & Chalmers of Canada, Limited.
- Flights—**  
Hendrick Mfg. Co.
- Forges—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.
- Forging—**  
M. Beatty & Sons.  
Smart-Turner Machine Co.
- Furnaces—Assay—**  
Lymans, Ltd.
- Fuse—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Gears—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
Hull Iron & Steel Foundries, Ltd.
- Hammer Rock Drills—**  
Mussens, Limited.
- Hangers—Cable—**  
Standard Underground Cable Co. of Canada, Ltd.
- Hand Hoists—**  
Darling Bros., Ltd.  
Fraser & Chalmers of Canada, Limited.
- High Speed Steel—**  
Armstrong, Whitworth of Can., Ltd.
- High Speed Steel Twist Drills—**  
Northern Canada Supply Co.  
Armstrong, Whitworth of Can., Ltd.
- Hoists—Air, Electric and Steam—**  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco.  
M. Beatty & Sons.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Wettlaufer Bros.
- Hoisting Engines—**  
Can. Fairbanks-Morse Co.  
Mussens, Limited.  
Sullivan Machinery Co.  
Fraser & Chalmers of Canada, Limited.  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons.
- Hose—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Ingot Copper—**  
Canada Metal Co., Ltd.
- Insulating Compounds—**  
Standard Underground Cable Co. of Can., Ltd.
- Jacks—**  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Kiln Linings—**  
Hull Iron & Steel Foundries, Ltd.
- Kominuters—**  
Hull Iron & Steel Foundries, Ltd.
- Lamps—Safety—**  
Canadian Explosives.
- Link Belt—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Jones & Glassco.
- Locomotives—**  
W. Fraser.
- Machinists and Founders—**  
Hull Iron & Steel Foundries, Ltd.
- Metal Merchants—**  
Henry Bath & Son.  
Geo. G. Blackwell, Sons & Co.  
Consolidated Mining and Smelting Co. of Canada.  
Canada Metal Co.  
C. L. Constant Co.
- Monel Metal—**  
International Nickel Co.
- Nickel—**  
International Nickel Co.
- Ore Sacks—**  
Northern Canada Supply Co.
- Ore Testing Works**  
Ledoux & Co.  
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Milton Hersey Co., Ltd.  
Campbell & Deyell.
- Ores and Metals—Buyers and Sellers of—**  
C. L. Constant Co.  
Geo. G. Blackwell.  
Consolidated Mining and Smelting Co. of Canada.  
Orford Copper Co.  
Canada Metal Co.
- Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
- Pig Tin—**  
Canada Metal Co., Ltd.
- Pig Lead—**  
Canada Metal Co., Ltd.
- Pipes—**  
Can. Fairbanks-Morse Co.  
Canada Metal Co., Ltd.  
Consolidated M. & S. Co.  
Pacific Coast Pipe Co., Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.
- Pipe Fittings—**  
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Northern Canada Supply Co.
- Piston Rock Drills—**  
Mussens, Limited.
- Pneumatic Tools—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco.
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Fraser & Chalmers of Canada, Limited



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| <b>Pumps—Centrifugal—</b><br>Can. Fairbanks-Morse Co.<br>Darling Bros., Ltd.<br>Escher Wyss & Co.<br>Mussens, Limited.<br>Smart-Turner Machine Co.<br>M. Beatty & Sons.<br>Can. Ingersoll-Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited | <b>Quarrying Machinery—</b><br>Sullivan Machinery Co.<br>Can. Ingersoll-Rand Co., Ltd.                                                      | <b>Screens—Cross Patent Flanged Lip—</b><br>Hendrick Mfg Co.                                                                                                      | <b>Surveying Instruments—</b><br>W. F. Stanley.<br>C. L. Berger.                                                               |
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# Ontario's Mining Lands

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Ontario, with its 407,262 square miles of area, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals, 70 per cent. of the rocks being of pre-Cambrian age.

The phenomenally rich silver mines of Cobalt occur in these rocks ; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Helen, Magpie and Moose Mountain mines.

Many other varieties of useful products are found in Ontario :—cobalt, iron pyrites, arsenic, quartz, graphite, talc, feldspar, mica, corundum, molybdenite, platinum, palladium, actinolite, apatite, fluorite, salt, gypsum, petroleum and natural gas.

Building materials, such as cement, brick, marble, limestone, sandstone, trap, lime, sand and gravel, are abundant.

Ontario in 1915 produced over 44 per cent. of the total mineral production of Canada, or more than twice that from any other Province. The preliminary report of the Ontario Bureau of Mines shows the output of the mines and metallurgical works of Ontario for the year 1915 to be worth \$57,532,844, of which the metallic production was \$47,721,180. There were 79 producing mines, 62 of which operated at a profit.

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For list of publications, illustrated reports, geological maps and mining laws, apply to

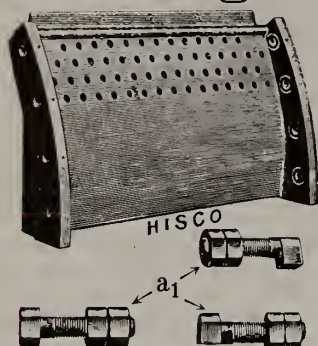
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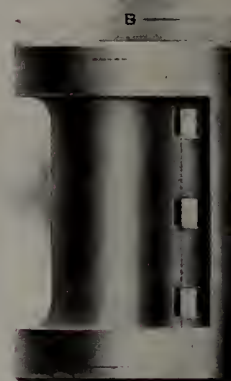
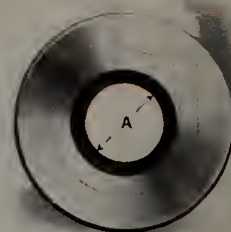
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VOL. XXXVIII

TORONTO

No. 9

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## DEPARTMENT OF MINES

HON. E. E. PATENAUDE, Minister.

R. G. McCONNELL, Deputy Minister.

### MINES BRANCH

#### Recent Publications

- The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.
- Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.
- Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
- Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.
- Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

- Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.
- Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.
- Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.
- Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.
- Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.
- Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

### GEOLOGICAL SURVEY

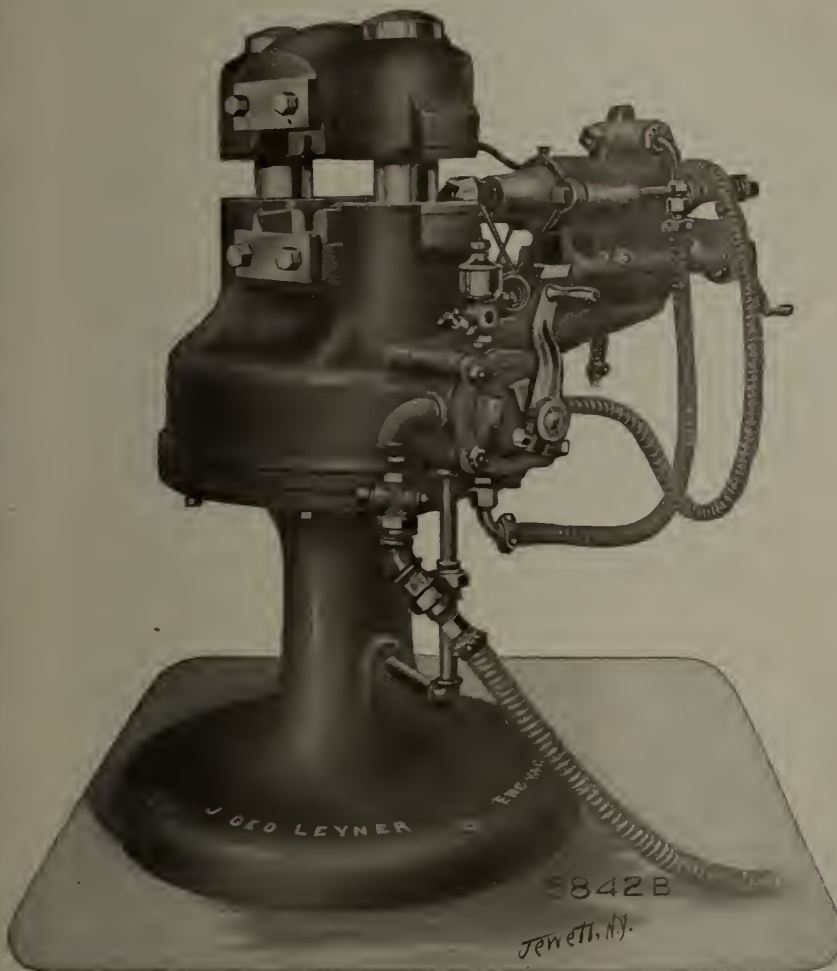
#### Recent Publications

- Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.
- Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.
- Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.
- Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.
- Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.
- Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.
- Memoir 81. The Oil and Gas Fields of Ontario and Quebec, by W. Malcolm.
- Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.
- Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Cammell.
- Memoir 85. Road Material Surveys in 1914, by L. Reinecke.
- Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.
- Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.
- Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.
- Ontario. Topography.
- Map 59A. Wheaton, Yukon Territory.
- Map 66A. Brechin Sheet, Ontario and Victoria Counties.
- Map 150A. Ponhook Lake Sheet, Nova Scotia.
- Map 153A. Asquith and Churchill Townships, Sudbury District, Ontario.
- Map 158A. Nanaimo Sheet, Vancouver Island, British Columbia.
- Map 175A. Ymir, Kootenay, British Columbia.
- Map 181A. Wood Mountain-Willowbunch Coal Areas, Saskatchewan.
- Applicants for publications not listed above should mention the precise area concerning which information is desired.
- Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.
- The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.
- Communications should be addressed to The Director, Geological Survey, Ottawa.



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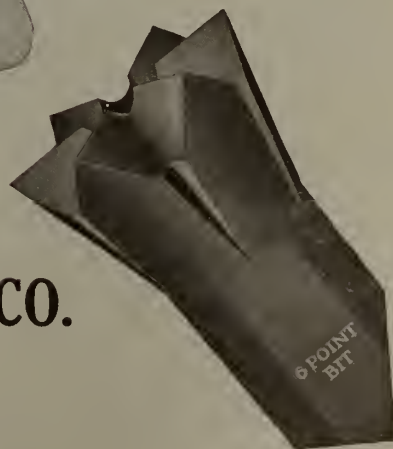
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| Air cost .....        | 3   | per cent. less   |
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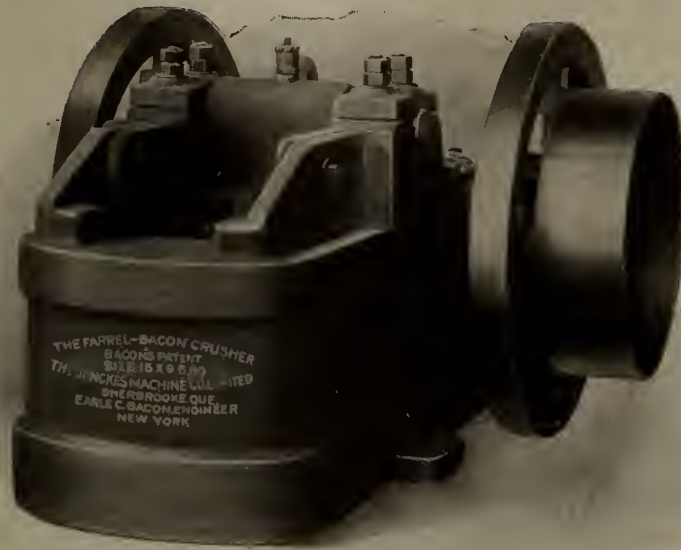
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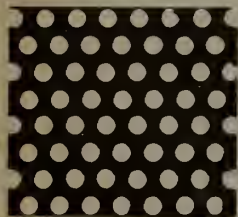
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### Aggregate Value of \$516,270,253

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### Production During last ten years, \$267,607,077

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

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#### Department of Colonization, Mines and Fisheries

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**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is \$10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of \$10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of \$5 an acre for SUPERIOR METALS, and \$3 an acre for INFERIOR MINERALS.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

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The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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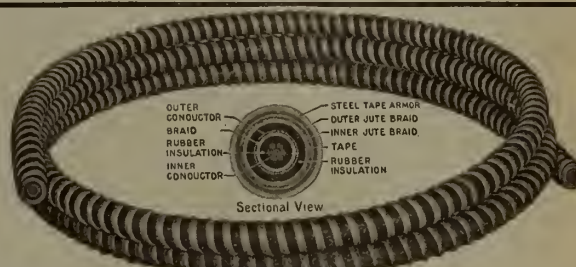
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, May 1st, 1917.

No. 9

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## ALIEN ENEMIES AND WESTERN FEDERATION DELEGATES.

Interviewed by the Toronto World last week the manager of a Porcupine gold mining company stated that inefficiency of labor at the mines has become a great problem. Many of the employees are doing very little work. They are, however, demanding higher wages. He states that alien enemies and walking delegates of the Western Federation of Miners are the chief causes of inefficiency.

The alien enemy problem is a serious one. Mine managers have in their employ many who do not deserve such considerate treatment as they are getting. Those who do a good day's work and who behave themselves properly should not have their liberties restricted unduly and should be given opportunity to earn good wages. On the other hand, it seems necessary to consider whether alien enemies who make themselves objectionable should not be taken in hand by the authorities. Loyal citizens in Northern Ontario are not likely to allow alien enemies in their midst to go much further than they have done already. It would be well, however, if our Government would take steps to curb the undesirables.

Should there not be provision made that alien enemies who are unwilling to do a full day's work in the mines may find themselves under military guard doing much more disagreeable work clearing the farms of Northern Ontario? Would it not be well also to provide that for the work of such undesirables the remuneration will not be unduly high?

While the Western Federation delegates are apparently taking advantage of the presence of alien enemies in Northern Ontario to foment trouble, it is not to be concluded that all Western Federation delegates are aliens, though many of them are. The Western Federation of Miners is an American organization with a record that stinks to heaven; but we have no reason to regard it as an enemy organization. Some of its officers are believed to be responsible for crimes worthy of Von Bissing; but among the members are desirable citizens. It is unfortunate for Northern Ontario that the miners have not banded themselves together without affiliating themselves with the Western Federation; but they have done so and therefore made it impossible for the mine managers to recognize their organization, for no manager in his proper senses will submit to the dictates of this alien federation.

There are few mining men who do not believe that miners should form organizations to treat with their employers and to further their interests in various ways. Every man who has his labor to market should strive to get as much as he can for it, and he is more likely to succeed if he unites with his fellow workers

for the purpose. A union among miners is just as necessary as a union in any other industry.

The cost of living in most mining districts is high and the wages should be high. It is therefore greatly to the advantage of the miners in Northern Ontario that they have a union to formulate demands to enable them to meet the present conditions. They doubtless consider also that they are in a stronger position owing to their affiliation with the American organization, and if that organization had a reasonably clean record they would have grounds for such belief.

Western Federation methods are not of a character to warrant success in Ontario. Intimidation and murder accompanied the last effort of the Federation in Michigan. There are so many decent citizens among the members of the miners' union of Northern Ontario, however, that it is scarcely credible that they will tolerate Western Federation methods in Canada, even if they have affiliated themselves with that organization.

It is reasonable to assume that the Western Federation officers are well posted as to the attitude of Canadians towards lawless agitators. It is also reasonable to assume that they recognize that the present is no time to try the temper of the public by typical Federation methods.

## CORRESPONDENCE

### STEEL ALLOYS CORPORATION.

Editor, Canadian Mining Journal:

Sir,—I enclose a prospectus of the Steel Alloys Corporation. The whole reeks of the wild-cat promoter.

What a war baby this is! It is born of Germany's "molybdenum guns smashing the impregnable fortresses of Europe" (see p. 4). And what a word for the promoter is molybdenum with the mystical MoS<sub>2</sub>. Ricketts & Co., Inc., have reported on the holdings. In middle of winter I understand even reputable firms make mistakes at times. The report is most definite as to its body, and most indefinite as to conclusions. Entire ignorance is shown with regard to occurrence of the mineral, the mode of concentration, mode of conversion to ferro, its price, conditions and cost of mining.

What a promotion!

Steel Alloys Corporation, incorporated in Delaware, is selling stock in New York and elsewhere (I am told) above par. The property is in the backwoods of Ontario (distance lends enchantment). Representatives of the New York American and Evening Mail visited the property and Mr. Mullally states "nothing but the love of truth could cause me to endorse this security."

We do love to be fooled, and we do love to fool and not be found out.

I know nothing of the personnel of the corporation or those connected with it. The above remarks arise from what appears on the face of the report and a general knowledge of the condition of the molybdenite situation.

A READER.

We have received from the Sullivan Machinery Co. copy of a new bulletin, No. 71-C, on air lift pumping methods and equipment, and bulletin No. 75-B, dealing with the standard straight line, two stage steam driven Sullivan air compressors, class WB-2.

## CHANGES IN ONTARIO MINING TAX.

It was proposed in a bill presented last month, that the tax on profits of mining companies operating in Ontario be increased from 3 to 5 per cent. It has been decided, however, that gold and silver mining companies earning less than \$1,000,000 annually shall pay the old rate.

In the case of mines, other than nickel or nickel-copper, the tax shall be three per cent. per annum on the excess of annual profits above \$10,000 and up to \$1,000,000, and in the excess above \$1,000,000 the same rates as those provided for nickel and nickel-copper mines. This is an added clause to the amendment to the Mining Tax Act. The new tax on nickel is to be five per cent. on profits from \$10,000 to \$5,000,000, with an increase of one per cent. on each \$5,000,000 profit above the first \$5,000,000.

Another new clause of the utmost importance in the bill as redrafted says: "The mine assessor shall ascertain the market value of the fine metal or other product or products, suitable for direct use in industries or arts without further treatment arising from or contained in the output of the mine.

"He shall deduct from the amount so ascertained the actual cost of marketing the metal or other products and of each process by which the metal or other product is refined or treated, as shall be established to his satisfaction by the owner, manager, etc., of the mine." He shall also make the deductions previously allowed. "And the balance after making the said deductions and allowances shall be deemed and taken to be the annual profits of the mine and the year's output for the purposes of this act."

A new clause, which will have direct effect in the arrangement hitherto effectual between the interlocking Canada Copper Co. and the International Nickel Co., provides that: "A sale (of the product of a nickel or nickel-copper mine) shall not be deemed a bona fide sale within the meaning of subsection 36, where it is made directly or indirectly by an incorporated company to another incorporated company, which is associated with or ancillary to the selling company, or which controls or substantially controls the price to be paid or credited to the selling company, for the output of the mine."

## NEW CALEDONIA NICKEL PRODUCTION, 1916.

According to Le Bulletin du Commerce, February 10, 1917, page 13, the following was the production of nickel ore and matte for the year 1916. The figures for preceding years, given in the Royal Ontario Nickel Commission Report, page 245, are inserted for comparison. It will be noted that the production for 1916 shows a considerable decline, doubtless owing to lack of shipping facilities.

|                          | 1913.  | 1914.  | 1915.  | 1916.  |
|--------------------------|--------|--------|--------|--------|
| Ni. ore (metric tons) .. | 93,190 | 94,154 | 48,576 | 30,679 |
| Ni. matte (metric tons)  | 5,893  | 5,277  | 5,529  | 4,935  |

The nickel ore averages less than 5 per cent. of nickel as shipped, or about 6 per cent. after drying at 100 deg. C. The matte contains about 45 per cent. of nickel and is shipped to Scotland, France and New Jersey, U.S.A., where it is bessemerized and brought up to about 80 per cent. of nickel before refining.

The shipments of chrome ore in 1916 amounted to 74,115 metric tons.



## THE STRATEGIC VALUE OF CAPE BRETON ISLAND.

(With Especial Reference to the Coal Fields.)

By F. W. Gray.

When the French monarchs of the old regime selected Louisbourg as the site of an impregnable fortress, proudly named the "Dunkirk of America," they had a proper conception of the strategic importance of the ISLE ROYALE, that outpost of Canada since known as Cape Breton Island.

Who holds the Island of Cape Breton commands the Cabot Straits and the Gulf of St. Lawrence, and if that same power holds also the Island of Newfoundland, the Gulf of St. Lawrence can be made a closed sea.

While the main ideas of naval strategy are the same in all times, yet to-day we think in terms of modern inventions. The advantages given to Cape Breton Island by its geographical position are at this date enhanced by the presence of large bodies of coal developed to a producing stage, by the existence of large iron and steel works and chemical plants, and by the existence in connection with these industries of commodious harbors, equipped with facilities for loading and discharging cargoes, and by rail connection with the mainland.

It may be laid down as an axiom that no modern nation can retain economic independence unless it possesses within its frontiers a supply of bituminous coal. Bituminous coal is the motive power of modern civilization. It has been truly said—and by a German military leader—that victory in the present war will go to the nation that can mine and carbonize the largest quantity of bituminous coal. No form of deep mining can be prosecuted without coal, and the absence of coal will effectually limit the mining of all metals and minerals.

Coal moreover is the source of the base of the most destructive modern explosives. Briefly, without coal the national armament would be limited to the weapons of the mediaeval knight.

As this war and its preliminaries have abundantly demonstrated, economic dependence spells sooner or later political subservience.

The importance of Cape Breton Island is chiefly this: With the exception of a strictly limited deposit of bituminous coal on the mainland of Nova Scotia, the Island of Cape Breton and the submarine territory adjacent, contains the only supply of bituminous coal in Canada east of the region of Weyburn and Estevan.

The national future of Canada, its maintenance of national integrity and political independence, is bound up with retention of possession of the coalfields of Cape Breton Island. This may seem a sweeping statement, originating in the mind of one who attaches undue importance to coal, but a little consideration of the present position of France, Italy, Switzerland, Norway, Sweden, Spain, Greece, and—to come nearer home—of Central Canada, will show that the statement is made advisedly. France and Italy would be impotent and defeated if it were not for the coalfields of Britain and the British Navy.

The position of the European neutrals to-day is dictated by the source of their coal supply. The safety of the United States lies not so much in vast territory and population as in the possession of the richest coalfields of the world, so situated as to be far removed from the

danger of foreign invasion. If Russia were not the possessor of coalfields she would be more helpless than Holland, more dependent than Denmark, because, and here is where the analogy interests Canadians, extent of territory, density of population and agricultural wealth are a menace only, if coal is absent.

In these times coal spells power. It is a necessity of nationhood.

Is it therefore too much to say that if Canada wishes to fulfil the glorious promise of her future she must guard as a precious jewel that remote Island which saw the dawning of British power and British ideals on this Continent, and stands not only as a sentinel over the broad and ancient commercial highway of the St. Lawrence, but is Canada's chief treasure house and depository of coal, a substance greater in potentialities than all the silver of Cobalt, or all the gold of Porcupine and Yukon.

As the principal British naval base in North Atlantic waters, Halifax will always retain its pre-eminence, and it only needed the actual stress of warfare to restore to by a long period of peace. It is an ice-free port, lend this Canadian port the lustre that had become dimmed in itself admirably to fortification and submarine defences, and its railway connections would be difficult for a hostile landing force to interfere with so far as the immediate hinterland is concerned. But of the two lines of railway that connect Halifax with Quebec and Montreal, one parallels the St. Lawrence river so closely as to be quite open to attack from the river and the lower gulf. The capture of Halifax by hostile forces would not so seriously impair our national defences as would the hostile occupation of Cape Breton Island. Those who have followed the course of events at Zeebrugge, on the Belgian coast, will realize what the Bras d'Or Lakes could be made as a submarine base if they fell into the hands of an enemy, and the analogy between the Dardanelles and the Straits of Canso must have struck every military observer who has ever passed through the narrow channel dominated by the imposing bulk of Cape Porcupine.

Imagine a geographical position which combines the strategic value of the Dardanelles and Gibraltar with the industrial importance of Pittsburg or Sheffield, and one has a fair and not exaggerated conception of what Cape Breton Island means to Canada, and conversely, one may deduce what nature the menace would assume were this island in enemy hands.

The potentialities of Cape Breton Island for defence, or for offense in the hands of a resourceful foe, are less or greater according to the smaller or larger concentration of industrial activities in the island, and the time seems to have arrived when the Government of Canada must take this matter under consideration in all that bears on the future of industrial expansion in Cape Breton.

Take for example the suitability of Sydney Harbor for a shipbuilding plant. The advantages of this site are too obvious to necessitate their being set out in detail; the thing is self evident. But a large shipbuilding industry in Sydney, with the provision of the dry-dock that would be a natural and necessary accompaniment, connotes at once adequate military and naval protection. Otherwise it will be foolish to multiply and concentrate still additional facilities in Cape Breton Island that would advantage an enemy in control of the island.



### MISREPRESENTING CANADIAN MINING SOCIETIES.

The Canadian Society of Civil Engineers has published a memorandum addressed to the Premier that should be read by every mining engineer. It completely misrepresents the case so far as mining men are concerned and is unworthy of the Civil Engineers who are responsible for it. Some of the statements are wholly inaccurate and indicate that the authors of the memorandum are very poorly informed. Decent civil engineers will be properly ashamed of the false statements made by their committee and will, we hope, take steps to see that the statements are retracted.

It is unfortunate that an Engineering Society should be guilty of presenting such misinformation to the Government. We have a right to expect from engineers, an honest and careful presentation of the facts. The memorandum prepared by the Society of Civil Engineers is a disgrace to the profession.

### THE SOURCES OF NICKEL.

The Ontario Nickel Commissioners say:

The ores that are worked primarily as sources of nickel fall naturally into three classes—(a) Sulphides, represented especially by the pyrrhotite-chalcopryrite ores of Sudbury and Norway. Ores of this class have been mined to a much smaller extent in Pennsylvania, Tasmania, Sweden, Italy, South Africa and elsewhere. The sulphides of iron and copper that are associated with the lead ores of southeast Missouri should also be mentioned as they have been worked for cobalt and nickel. (b) Silicates or oxidized ores, of which the chief occurrences are those of New Caledonia. Similar ores occur in Greece, Madagascar, North Carolina, Oregon and in other countries. (c) Arsenical ores, usually containing both nickel and cobalt, the principal working mines being those of Cobalt, Ont. Ores of this nature have been worked in Saxony, Bohemia, France and elsewhere.

Other sources of nickel are (d) blister copper, which contains nickel and other metals, (e) manganese ores of the earthy class known as wad, sometimes rich in cobalt and to a lesser extent in nickel, (f) nickeliferous iron ores, such as those of Cuba, the nickel forming a valuable ingredient in the iron or steel produced from such ores, but not being separable, commercially, from the iron.

Mr. W. R. Burge, for many years connected with the Jenckes Machine Co., Ltd., of Sherbrooke, Que., and for the past several years in charge of their Toronto branch, has severed his connection with the company and gone over to the Toronto office of the Allis-Chalmers Co., Ltd. Mr. C. S. Horton, who for nine years has had charge of the Cobalt and Porcupine branch of the Jenckes Machine Co., will have charge of the Toronto district as well, with offices in the Traders' Bank Building.

### DISASTER AT PUEBLO MINE, IN WHITEHORSE COPPER CAMP, YUKON TERRITORY.

On April 6th the Whitehorse Star published the following statement of Mr. W. D. Greenough, manager for the company operating the Pueblo copper mine, situated near Whitehorse, Southern Yukon, at which a disaster occurred on March 21, causing the death of six of the miners. The finding of the Government inspectors appointed to make an investigation is also reprinted herewith.

#### Manager Greenough's Statement.

"On the morning of March 21st, I went to the 500 level with Mr. Berg. I was in the habit of going to the 500 level every morning to keep in close touch with the development work being done on this level. This particular morning Mr. Berg accompanied me at my request with a view of determining and locating some diamond-drill work to be done on this level. After checking up the development work and determining the directions of the proposed drill holes, I came on top.

"Mr. Berg came up to report to me about 10 o'clock a.m., that the 400 stope was taking weight, and that he had taken his men out of the stopes. I was satisfied that he had done everything that was necessary in taking his men out and attached no particular importance to the timbers taking weight. Mr. Berg then went back underground and at about a quarter to twelve o'clock sent for me to come down to the 300 level, stating that he had a cave in the mine.

"In company with Fred Porter, the engineer, I went to the 300 level and found that the west stope had caved, also ascertained that nine men were either in or behind the cave. Mr. Berg, with the day-bosses Adams and Domitrovitch, had already started work. I sent for Norman McLeod, the night boss, and the rescue work was continued as fast as possible until the evening of the 29th, when it was found necessary to abandon the rescue work together with the underground equipment and machinery, owing to the unsafe condition of the shaft.

"When the rescue work was started I cautioned Adams, Domitrovich, McLeod and Supt. Berg to be particular and report any signs of the shaft taking weight. On the 29th at noon I thought it advisable to have a careful survey of the shaft made with a view to giving the rescue party every possible protection. At noon of this day I requested Mr. Berg to take Dennis P. Dwyer and make a careful inspection of the shaft. I chose Mr. Dwyer because he was acting in the capacity of utility man and had put in more than two months actual time in the shaft on repair work, therefore he would be familiar with the shaft from the collar to the 500 level. They made the inspection and reported to me about 4 o'clock. The report was not favorable; I then called in Norman McLeod and Angus McDougal and had them go over the shaft with Berg and Dwyer. They reported at 7 o'clock that the shaft was unsafe, and recommended that the men working on rescue work should be taken out immediately. This recommendation was immediately carried out, abandoning all the underground equipment and machinery.

"In my opinion the cave was due to the action of the water passing through some slips on the hanging wall side. This action continued until it made a weak point, which might have been either below or above the 300 stope, and was unavoidable owing to the fact that it could not and was not noticed by any of the mine staff or the miners.

"Mr. Berg was particularly attentive to his work and gave practically all of his time and attention in directing the underground work. His shift bosses, Norman McLeod, Robert Adams, and George Domitrovich, were competent and experienced miners.



"The mine was exceptionally well timbered and all apparent weak points were bulkheaded. The least distance of solid ground between the 300 level and top of the workings on the 400 level was 40 ft., and at this point the ground was only mined three sets wide by two sets long, a space of 15 by 10 ft., and one of these sets was on the solid or footwall, thereby leaving a space of only five square sets well timbered.

Therefore, I do not believe that the workings on the 400 level were directly the cause of the cave."

#### Finding of Inspectors.

The finding of the inspectors was as under:

"After hearing the foregoing evidence the inspectors appointed by George N. Williams, Esquire, administrator Yukon Territory, under section 8, chapter 45, Miners' Protection Ordinance of the Yukon Territory, find:

"1. We consider that the cave-in, or collapse, of the stopes from the 200-ft. to the 400-ft. levels was an unavoidable accident.

"2.—The direct cause of the cave-in, or collapse, of the stopes, we believe to have been from the many watercourses, which washed away the silt, sand, etc., which acted as binders. The Pueblo mine is what is known as a 'wet mine,' and there are many watercourses throughout the property, and it is probable that water had accumulated in some unknown chamber in such volume as to cause great pressure, and this pressure would find an exit at the point of least resistance, and if such point happened to be in the hanging wall of one of the stopes it would naturally cause the cave-in, or collapse; and if the hanging wall gave way it would be natural for the pillar above, or the back, to fall in.

"3.—The system of timbering in the Pueblo mine was what is known as 'square setting,' a system which we consider the strongest and safest known. We believe that the timbering of this mine was done in a scientific and workmanlike manner, and the evidence shows that at no time was there any shortage of timber, tools or machinery.

"4.—We believe that the management of the Yukon Copper, Ltd., working the Pueblo property, used every possible and known precaution they considered necessary to safeguard the lives of the employees; in fact they went farther than the usual timbering of the mine, by using solid bulkheads of timber.

"5.—We consider that every possible effort was made by the rescue parties to rescue or recover the six unfortunate miners who lost their lives in the cave-in, or collapse, and the rescue work was stopped only when the management of the mine found the shaft to be unsafe.

"Dated at Whitehorse, in the Yukon Territory, this third day of April, A.D. 1917.

(Sgd.) "Arthur Lionel Bell, Inspector.  
"Dan J. McDonald, Inspector."

It should be added that of the nine men imprisoned in the mine when the cave-in took place, three were rescued, the rescue-party having reached them by driving through rock away from the loose slide. These men were little the worse for their long confinement.

There were twenty witnesses examined at the investigation, and the testimony of all was to the same effect as that of the manager, given above, though, of course, there was much more detail obtained from so many witnesses.

### UTILIZATION OF PEAT—III.

By Louis Simpson.

(Continued from April 1st issue.)

#### Cost of Gas Producer Plant; Including the Cost of By-Product Recovery and Sulphuric Acid Plants.

|                                                                                                                                                                                                                                                                                                                               |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Gas producer plant of a capacity to consume 475 tons of 65 per cent. peat per day, and consisting of 20 gas producers, all consuming 174,000 tons of 65 per cent. peat, per day; together with the necessary by-product recovery, tar recovery, and distillation, sulphuric acid, and sulphate of ammonia plants—complete.... | \$500,000 |
| Railway siding to connect works with railroad. . . . .                                                                                                                                                                                                                                                                        | 35,000    |
| Boarding house and houses for employees..                                                                                                                                                                                                                                                                                     | 50,000    |

Total cost of plant with sundries... \$585,000

Note.—The cost of connecting siding with existing railroads must of necessity vary according to the requirements of the location.

#### Cost of Operating Gas Producer Plant, Etc.

|                                                                                                               |                        |
|---------------------------------------------------------------------------------------------------------------|------------------------|
| Salaries—Management, laboratories, and office. . . . .                                                        | \$12,000               |
| Repairs—Wages and material . . . . .                                                                          | 12,500                 |
| Power—250 E.H.P., from own power house at \$10 . . . . .                                                      | 2,500                  |
| Taxes. . . . .                                                                                                | 3,000                  |
| Sundries. . . . .                                                                                             | 12,000                 |
| *Raw material for sulphuric acid. . . . .                                                                     | 65,772                 |
| **Wages. . . . .                                                                                              | 41,800                 |
| Depreciation—10 per cent. upon \$500,000...<br>1 per cent. upon \$35,000....<br>2½ per cent. upon \$50,000... | 50,000<br>350<br>1,250 |
|                                                                                                               | <hr/> \$201,172        |

The following data has been obtained through the courtesy of a producer gas engineer, and may be accepted as being the results obtainable from a modern gas producer plant operating upon 65 per cent. peat, of a quality conforming to the following analysis:

|                                                      | Theoretically dry. | As fired, viz., 65% peat. |
|------------------------------------------------------|--------------------|---------------------------|
| Moisture. . . . .                                    | 0.0                | 35.0                      |
| Volatile matter. . . . .                             | 56.2               | 36.6                      |
| Fixed carbon. . . . .                                | 32.4               | 21.1                      |
| Ash. . . . .                                         | 11.4               | 7.4                       |
| Sulphur. . . . .                                     | 3.1                | 2.0                       |
| *Nitrogen. . . . .                                   | 2.0                | 1.3                       |
| B.Th.U., per lb. . . . .                             | 9100               | 5900                      |
| Cub. ft. of gas, per lb. . . . .                     | 46                 | 30                        |
| Value of gas in B.Th.U., per cub. ft. . . . .        | 130                | 130                       |
| Lb. sulphate of ammonia recovered, per ton . . . . . | 210                | 137                       |

It is claimed that 175,000 short tons of 65 per cent. peat, having a calorific value of 9100 B.Th.U. per pound of dry peat, will, when burned in a modern by-product gas producer—the resultant gas being burned under a steam boiler, specially constructed for gas firing, the steam so raised being used in a condensing steam turbine-generator—develop 10,000 E.H.P. years.

The calorific value of a pound of dry Canadian peat varies from 9800 B.Th.U. down to 7490 B.Th.U.; but 37 per cent. of the peat from examined bogs possesses a value of 9000 B.Th.U., or over 174,000 tons of 65 per

\* \*\*Note.—Both these costs are likely to be reduced. It is possible that a quantity of acid may be sold to local consumers, at highly remunerative prices, and the profits, so made, might materially reduce the cost of the acid used in the manufacture of the sulphate of ammonia.

\*Note.—About 25 per cent. of the Canadian bogs examined, give a return of nitrogen of 2 per cent. and upwards.



cent. peat having a calorific value, when dry, of 9100 B.Th.U., will produce 10,440,000 thousands cubic feet of producer gas having a calorific value per cubic foot of 130 B.Th.U., which, at 3 cents per 1,000 cubic feet, totals \$313,200.

From one ton of 65 per cent. peat, which, when dry, contains 2 per cent. of nitrogen, 105 pounds of sulphate of ammonia should be recovered. Therefore, the total return from 174,000 tons of 65 per cent. peat should be 9,135 short tons.

#### Revenue From Sale of By-Products.

|                                                         |           |
|---------------------------------------------------------|-----------|
| Sulphate of ammonium, 9,135 tons at \$60...             | \$548,100 |
| *Tar, 7,000 tons at \$10 .....                          | 70,000    |
| Ash, 12,180 tons at \$1.....                            | 12,180    |
| Gas—given power plant without charge or wasted. . . . . | .....     |
| Total annual revenue .....                              | \$630,280 |

#### Profit and Loss.

|                                                             |                 |
|-------------------------------------------------------------|-----------------|
| Revenue from sale of by-products .....                      | \$630,280       |
| Less—                                                       |                 |
| Cost of peat, 174,000 tons at 37.07 cents . . . . .         | \$ 64,490       |
| Cost of operating gas producer plant. . . . .               | 201,172         |
|                                                             | <hr/> \$265,662 |
|                                                             | \$364,618       |
| Add net rents received from workmen's houses . . . . .      | 2,000           |
|                                                             | <hr/>           |
| Total net profit after providing for depreciation . . . . . | \$366,618       |

#### Total Cost of Plant.

|                                      |                 |
|--------------------------------------|-----------------|
| Peat bog and machinery.....          | \$150,000       |
| Gas producer plant and sundries..... | 585,000         |
|                                      | <hr/> \$735,000 |
| Add working capital .....            | 40,000          |
|                                      | <hr/>           |
| Total capital employed.....          | \$775,000       |
| Say . . . . .                        | \$800,000       |

The profit of \$366,618 provides 45 per cent. return upon the capital. Since it may not be desirable, even were it possible, to allow such a large quantity of producer gas to escape and dissipate into the atmosphere, it will probably be necessary to find some economic method whereby this waste gas may be utilized.

Three possible methods of effecting the economic utilization of the waste gases are as follows:

(a) Burn the gas under steam boilers, using the steam so raised in some manufacturing process; or through the use of a steam turbine-generator, develop electric power. Electric power so developed could be produced at a comparatively low cost; because gas-fired boilers can be operated very economically.

(b) Pipe the gas to nearby manufacturing plants, where it can be used as fuel for the raising of steam, or for the purposes of heating, drying, or baking. In fact, the gas might be used to displace coal whenever used, directly, or indirectly, in any process of manufacture.

(c) Pipe the gas to nearby towns or cities and supply it to the citizens thereof, for heating purposes, or even for cooking; or for the purpose of developing power in small units, by the use of gas engines.

While the disposition of the gases described under

(A) could be arranged for at the least trouble, it would not be as remunerative as either of the other two methods; which, while probably involving a smaller capital expenditure, would yield a larger annual income.

A power plant of the description already mentioned, and with a capacity of 10,000 E.H.P. years at the switchboard, would cost \$500,000.

The operating cost would be as follows:

|                                   |          |
|-----------------------------------|----------|
| Fuel. . . . .                     | Nothing  |
| Labor. . . . .                    | \$ 7,000 |
| Repairs and sundries .....        | 3,000    |
| Depreciation, 7½% on \$500,000... | 52,500   |

|                                   |           |
|-----------------------------------|-----------|
| Total operating cost .....        | \$62,500  |
| 10,000 E.P.H. years, at \$10..... | \$100,000 |
| Operating cost as above .....     | 62,500    |

|                              |        |
|------------------------------|--------|
| Profit. . . . .              | 37,500 |
| or 7½% upon the expenditure. |        |

While the return indicated is not very great, yet, as the required capital could probably be provided by an issue of bonds, the balance to the credit of profit being sufficient to take care of the interest and sinking fund charges, it would be better to make such use of the gases rather than wasting them by discharging them into the atmosphere and thus incurring certain serious risks.

The total expenditure required—were the schemes outlined under (B) and (C) carried out—is so regulated by local conditions, that no good purpose would be served by making an estimate. Suffice it to say that the gas could be distributed at a profit, within a radius of twenty miles. This has been proven in England, where the South Staffordshire Mond Gas Co., Ltd., have shown the economic possibility of distributing producer gas—obtained by the combustion of a low-grade of coal—and where it has been sold at prices ranging, according to quantity consumed, from 5½ cents per 1,000 cubic feet to 3 cents per 1,000 cubic feet. At the latter price it is estimated that it costs the consumer less, considering the results obtained, than coal at the prices current in England before the war, which prices were lower than are current in Canada.

The cost of carting, storing and firing coal in Canada is, because of the higher wages paid, and because of the exigencies of the climate, much greater than in England, where it is usual to have coal delivered and dumped into the boiler house, day by day, fresh from the colliery, and as required. Mr. H. A. Humphrey, C.E., in Vol. CXCII., page 42, of the Proceedings of the Institute of Civil Engineers, under the caption "The Generation and Distribution of Producer Gas in South Staffordshire," described the South Staffordshire installation.

It is not claimed that every deposit of peat in Canada can be exploited with the financial results herein indicated. The results are in all cases dependent upon the following three factors:

(1) Character of the bog: Including commercial extent and depth of deposit; good quality of peat; comparative freedom from roots, and capability of being drained satisfactorily.

(2) Advantageous location of bog.

(3) Efficient management.

Unless all three of the foregoing conditions are complied with, the exploitation of peat bogs will only result in failure and disappointment, as in the past history of the peat industry in Canada.

\*Note.—The tar obtained from the combustion of peat is of a very superior quality.



## ANNUAL MEETING OF THE MINING SOCIETY OF NOVA SCOTIA.

The twenty-fifth annual meeting of the Mining Society of Nova Scotia was held at the Sydney headquarters on the 19th April, and was attended by about seventy-five members.

The morning was occupied by a visit to the works of the Dominion Iron & Steel Company, in which the whole process of steel manufacture was followed from the ore-bins to the finished product. In the afternoon the business of the society and the reading of papers was proceeded with. The report of the treasurer showed a satisfactory condition of the society's finances.

The officers of the society for 1917 were elected as follows, the election of the president, vice-president and secretary-treasurer being by acclamation:

President, Hon. Col. D. H. McDougall; Vice-President, Hon. Col. Thomas Cantley; Secretary-Treasurer, E. C. Hanrahan; Associate-Secretary, E. A. Saunders.

Members of Council: F. J. Sexton, T. J. Brown, J. R. McIsaac, Hon. Robt. Drummond, F. E. Lucas, H. B. Gillis, Alex. McEachren, G. D. MacDougall, Malcolm Beaton, W. H. Graham, Malcolm Blue, F. W. Gray, C. M. Odell, John Casey, R. E. Chambers, Isaac Greenwell, John Johnson.

Colonel D. H. McDougall, General Manager of the Dominion Steel Corporation, the president-elect for a second term of two years, gave a presidential address, which will be reproduced in full in the May issue of the Journal.

The list of papers presented is as follows:

John Casey—"Safety and Mine Discipline."

W. H. Graham—"Some Notes on the Advantages of Efficient Coal Washing as Reflected in the Manufacture of Iron and Steel."

F. W. Gray—"The Strategic Value of Cape Breton Island, With Especial Reference to the Coal Fields."

Vincent McFadden—"A Proposal for the Complete Electrification of the Industries and Transportation of Cape Breton Island."

Geo. D. MacDougall—"Modern Steel Plant Economics."

C. M. Odell—Title to be announced.

Robert Robertson—"Sinking of the Jubilee Shaft, Sydney Mines."

Prof. F. H. Sexton—"Vocational Training for the Crippled Soldier."

A. J. Tonge—"Mine Fires, Their Origin, Control and Extinction."

As the business of the meeting was confined to one afternoon session there was not time to read and discuss the whole of the papers. The papers will, however, appear in the society's transactions, and it was decided by the meeting that all the papers should be open for discussion at the next annual meeting, which, it is hoped if war conditions will permit, will resume the customary form of a two days' meeting with the annual dinner.

On the recommendation of the Executive the meeting appropriated the sum of \$100 to the "Belgian Kiddies Fund" of which Mr. E. P. Mathewson of Toronto is the chief sponsor for Canada.

The meeting was actuated in its selection of the "Belgian Kiddies Fund" by a desire to honor Mr. H. C. Hoover. As a leading member of the mining profession, Mr. Hoover's record during the war has been one which reflects lustre on the profession, and the fact that he is a citizen of our latest ally is fully appreciated.

A select committee composed of Messrs. T. J. Brown,

G. D. MacDougall, Prof. F. H. Sexton, and F. W. Gray was named to look into and report on the possibility of finding some satisfactory basis of federation or affiliation with the Canadian Mining Institute.

The meeting moved that there be recorded in the society's transactions a resolution setting forth the unanimous appreciation of all the members of the society of the patriotism and self-sacrifice of the miners of Nova Scotia during the war. The resolution covered all branches of mining in the province, as it was felt that the rank and file of the profession, whether coal-miners or metalliferous miners, evinced the same eagerness to serve their country on the firing line. The meeting adjourned in the late afternoon and there was no evening session. The consensus of those who attended was that the meeting had been extremely successful.

The number of papers presented and offered did not by any means exhaust the capacity of the members and the time at the disposal of the meeting was all too short for full discussion. The society will have sufficient material in its transactions for 1917 to provide the widest scope for mature discussion at the next annual meeting, without the necessity of additional papers.

The meeting was thoroughly representative of the mining profession of Nova Scotia and was entirely made up of practical men busily engaged in the daily practice of their profession.

## DETERMINATION OF MOLYBDENUM.

Directions covering the method for quantitative determination adopted by the U. S. A. Bureau of Mines follow:

Digest the sample of ore—from 0.2 gram to 5 grams, depending upon its seeming richness—with 25 to 35 c. c. of fuming nitric acid in an Erlenmeyer flask for three hours and finally evaporate to dryness. Add 3 c. c. of concentrated sulphuric acid to the residue and heat until dense white fumes are given off in quantity. Cool, dilute to 100 c. c., and filter. Wash the residue with water, allowing the wash water to run into the filtrate. Wash the residue well with dilute ammonia (1 to 3), and then with water. Make the filtrate alkaline with ammonia to precipitate the aluminum and any iron present in the original mineral. Heat, filter, and wash well with hot water. Saturate this alkaline filtrate with hydrogen sulphide to a bright cherry red color. Filter and wash with hot water. Acidify the filtrate with hydrochloric acid until slightly acid and digest until the precipitated sulphide and sulphur are well coagulated and the excess hydrogen sulphide expelled. Filter on a weighed Gooch crucible. Evaporate the filtrate to dryness in a casserole and drive off the ammonium salts at the lowest possible temperature, being careful not to heat the casserole to redness at any time. Take up the final residue with about 100 c. c. of water to which 5 c. c. of ammonia has been added. Add 10 c. c. of ammonium sulphide, make faintly acid with hydrochloric acid, and digest until the sulphide is coagulated. Filter this on the Gooch crucible used for the previous sulphide filtration. Add an amount of sulphur to the combined sulphides equal to about one-half their weight and ignite over a Bunsen burner at a dull-red heat in a stream of arsenic-free hydrogen for ten minutes. The ignition may be accomplished by using a Rose crucible cover and tube over the Gooch crucible. Weigh and repeat the ignition as before, until check weights are obtained. The weight obtained is the weight of molybdenum disulphide.



## WHEN THE COAL MAN VISITED THE STEEL MAN.

Apropos of the recent visit of the Mining Society of Nova Scotia to the Sydney Steel Works.

They led him to the Blast Furnace, he gaped upward at the "bosh,"

With its head pushed through the roof-tree like some huge Buddhistic joss.

Bubbling red, a fiery river came outpouring thick and quick,

When some dusky parboiled negroes jabbed its tum-tum with a stick.

But when someone cleaned a peephole and the hot-blast gave a yell—

His predominant impression was the place resembled—Well!

He ambled to the Bessemer, pirouetted up the stair, They locked him in an iron shack with electric switches bare,

Then bade him through the windows squint, talking much of sulphur flame.

The rheostat sprang another notch. If he jumped, was he to blame?

Said the steel man to the coal man: "I hope you're enjoying yourself."

Whispered the coal man deep and hoarse: "It's a conning tower in—Well!"

He tottered to the Open Hearth, where they hitched a door up higher.

They stuck blue glasses on his nose, saying, "Sonny! See that fire?"

He saw that incandescent lake and thought of Ferdinand,

Of Hohenzollern William and the whole Teutonic band: But as the ladle swung o'erhead so very "promiscuous like,"

"Now, to this neighborhood," he said, "I much prefer the pike!"

So forthwith to the Blooming Mill the victim now was led,

Astonished much the steel man gasped, for the coal man wasn't dead!

Nay, from that hour the coal man felt as he were himself again,

He understood the *raison d'être* of his antecedent pain. When he perceived the glowing bars from which H. E. shells are made—

To paralyze Herr Hindenburg—he praised well the steel man's trade!

The coal man pitward bent his steps, musing on the things he'd seen.

Said he: "I much prefer the pit-bottom and the screen."

The steel man said: "I never did feel like working down a pit,"

"If I heard the timbers creaking, I would surely have a fit."

But to the citizen who wields no tool mightier than the pen,

The coal man and the steel man are both brave and worthy men.

## L'Envoi.

In the cool darkness of the mine, or where the pulsing gases dance,

Where fire creates the nascent shell: men of ours we see in France.

When in the mine the blast is fired, we hear the Flanders drum-fire,

Here, the Bessemer lights the sky. There, the star-shell lights the mire.

If we fail here, our men fail there, so stand we altogether,

That we may sing, "God Save the King," the Maple Leaf forever!

F. W. Gray.

## GRANBY CONSOLIDATED M. S. AND P. CO.

On March 24 the Boston Commercial published the following information relative to the Granby Consolidated Mining, Smelting and Power Co.: "Granby directors have declared a regular quarterly dividend of \$2.50 a share, the same as was paid in February. This dividend will be payable on May 1; it calls for the disbursement of \$374,963, and will make \$53 a share paid by this company since organization, bringing its total disbursements up to \$7,523,018. Granby paid \$7 in 1916, \$3 in each of the two preceding years, and \$6 in 1913."

Taking the published accounts of the Granby Consolidated Company for five fiscal years to end of June, 1916, it is seen that the dividend payments have been as under:

| For year ended      | Per share. | Total.    |
|---------------------|------------|-----------|
| June 30, 1912 ..... | nil        | nil       |
| June 30, 1913 ..... | \$3        | \$449,955 |
| June 30, 1914 ..... | \$6        | 899,000   |
| June 30, 1915 ..... | nil        | nil       |
| June 30, 1916 ..... | \$6        | 899,911   |

Total for five years ..... \$2,249,767

Payments during the fiscal year ending June 30, 1917, will total \$1,349,866.80 (less some small amounts that will be held in the company's Liquidator Dividend account, there being some fractional parts of shares that necessitate such adjustment in the accounts each year, and which are the cause of the difference between the two fiscal years of 1914 and 1916 (shown in the table above), in the following quarterly disbursements:

| Payable                | Per share. | Total.     |
|------------------------|------------|------------|
| August 1, 1916 .....   | \$2.00     | \$ 299.970 |
| November 1, 1916 ..... | 2.00       | 299,970    |
| February 1, 1917 ..... | 2.50       | 374,963    |
| May 1, 1917 .....      | 2.50       | 374,963    |

Total for fiscal year ending June 30, 1917. . . . . \$1,349,866

It will be seen, therefore, that the company's dividend disbursements in the current fiscal year will be equivalent to 60 per cent. of the grand total for five fiscal years ended June 30, 1916. This simple statement, however, does not do justice to the financial position of the company, since its net profit for its last fiscal year, in which it sold 42,198,083 lbs. of copper at an average price of \$0.2204 a pound, was \$3,819,295, while this year the average price will doubtless prove to have been higher, with, of course, some increase in costs, wages and materials being higher also.



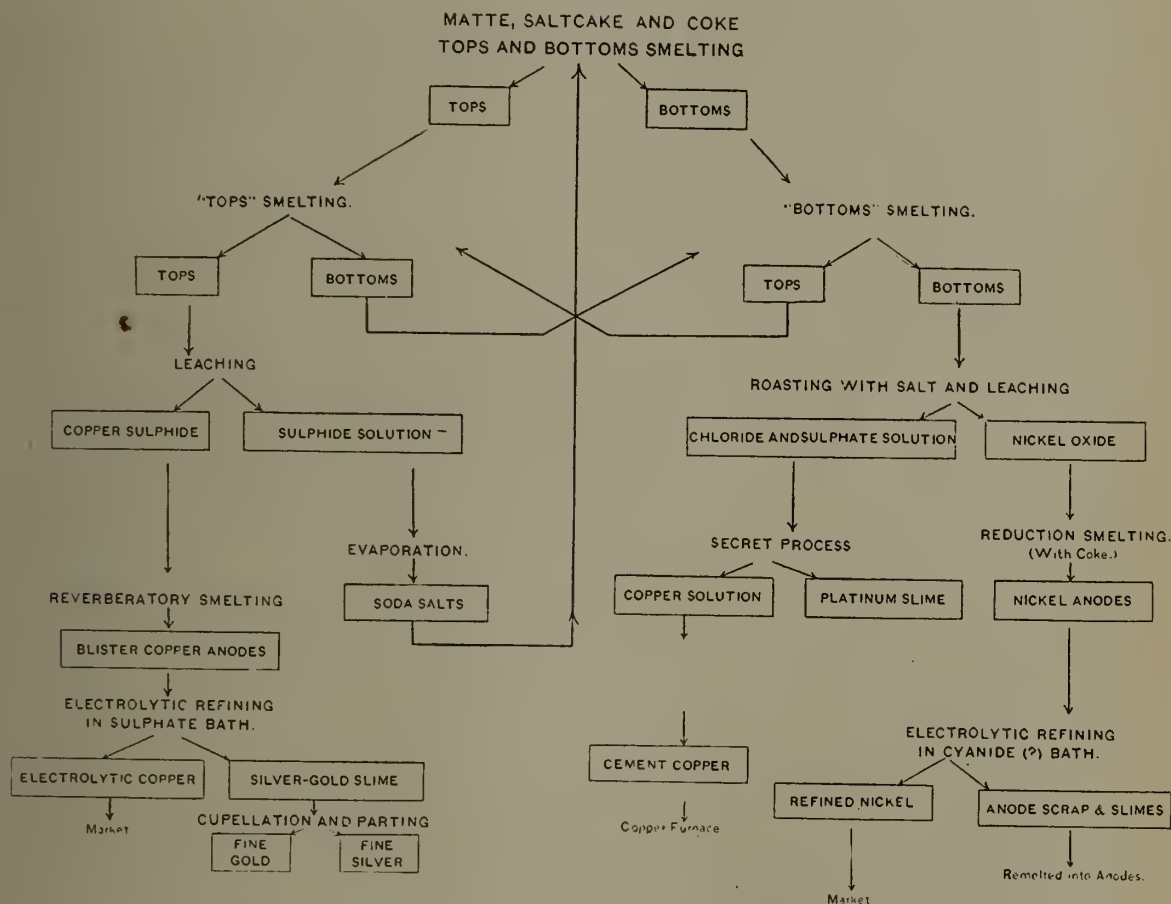
### THE ORFORD PROCESS OF REFINING NICKEL.

There are three processes, which may be described as standard methods, in use for the refining of nickel from ores like those of Sudbury. These are (1) the Orford process, employed for the treatment of the matte produced by the Canadian Copper Company, (2) the Mond process, and (3) the Electrolytic process. For all these processes, the production of a matte is essential. Matte is made by substantially the same method for all three.

The Orford process is the oldest of the three. It is cheap to operate, and permits of a large output in a confined space, but it does not recover more than a small proportion of the precious metals present in the ores, and there is reason to think that losses of nickel

it contains, it can be smelted in a reverberatory furnace, for the production of metallic nickel. The leaching processes result in the production of a considerable amount of copper sulphate and nickel sulphate. The former is treated for the production of metallic copper, but the latter is, to a considerable extent, crystallized out, and either treated electrolytically for the production of high grade electrolytic nickel, or sold as nickel sulphate or as the double sulphate of nickel and ammonium for electro-plating and other purposes.

The Orford process, being partly chemical, produces large quantities of noxious effluents. At the Bayonne works over 150 million gallons are annually run into the sea. The plans for the new works at Port Colborne, Ontario, provide for the elimination of this discharge. —Report of Ontario Nickel Commission.



and copper are heavier than in either of the other two processes.

In the Orford process, the matte is smelted with sodium sulphate and carbonaceous matter, such as coal or coke, so that a large proportion of the copper is separated as a double sulphide of copper and sodium, when tapped from the furnace; this separates as an upper layer above a matte which is much richer in nickel and poorer in copper than the original matte. A repetition of the smelting of this highly nickeliforous matte results in a further separation of copper in the same way, so that finally, the bulk of the copper is obtained as a slag (which is smelted to produce blister copper) together with a matte so rich in nickel and so poor in copper that, after being roasted and leached with acid, to remove the remainder of the copper which

### INTERNATIONAL COAL AND COKE CO.

The annual meeting of shareholders in the International Coal and Coke Co., operating coal mines near Coleman, Southwest Alberta, was held in Spokane, Washington, on March 22. Mr. A. C. Flumerfelt, of Victoria, B.C., was re-elected president of the company; Mr. H. Davidson, of Vancouver, B.C., vice-president; Mr. A. L. White, of Spokane, second vice-president; and Mr. W. G. Graves, also of Spokane, secretary. These officers, with Mr. C. S. Houghton, of Boston, Massachusetts, and Mr. R. W. Riddell, of Coleman, managing director, constitute the board of directors. Mr. O. E. S. Whiteside, of Coleman, continues as manager of the company, and Mr. John McKeagan, also of Coleman, is treasurer.

### BRITISH AMERICA NICKEL CORPORATION, LIMITED.

The British America Nickel Corporation, Limited, a strong British-Canadian company, which is controlled by the Imperial Government, has broken ground for the construction of large smelting and refining works near Sudbury for the production of refined nickel. The operations of the company, as contemplated at present, will be unique in the history of the industry in the important particular that the mining, smelting, and refining of its ore will all be conducted not only within the province, but within the Sudbury district; and for this and other special reasons the progress of its undertaking has been followed with unusual interest. The following information is given in the Report of the Ontario Nickel Commission:

The company owns approximately 17,600 acres of mineral land which include the following copper-nickel properties, namely: The Murray, Elsie and Lady, Violet mines; the Gertrude mine; the Whistle and Wildeat mine; the Victor and Blue Lake group; Nickel lake; and what are known as the Falconbridge properties. All its nickel holdings were bought from the Booth-O'Brien company called The Dominion Nickel-Copper Company. It has acquired the exclusive rights for North America in the electrolytic process for producing metallic nickel, known as the Hybinette process, which the company will use for refining the Sudbury ores. This process has been in practical operation for some years at the works of the Kristianssands Nikkelraffineringsverke at Kristianssands in Norway. It was first employed in America at the plant of the North American Lead Company at Fredericktown, Missouri, in connection with a lead-copper-nickel property there, and it was indirectly through this connection that the promoters of the present company first got in touch with its owners for the subsequent purchase.

The late Dr. F. S. Pearson, the well known financier of New York and London, took an active part in the protracted negotiations and series of transactions which finally resulted in the purchase of all the Ontario assets in the Dominion Nickel Copper Company, and of the rights in the Hybinette process. In September, 1912, an option was obtained on all the properties and assets in Ontario of the latter company, which included a short line of railway called the Nickel Range Railway, for a large purchase price, of which \$1,000,000 was payable in cash. After considerable exploration work which established new orebodies, especially on the Murray-Elsie properties, the option was taken up, and an agreement for purchase concluded between the owners and Pacific Securities, Limited, an office company incorporated under the Dominion Companies Act for the purposes of the transactions in hand. It is said that \$800,000 was spent in diamond drilling on the various properties.

In the meantime the Hybinette electrolytic process had been carefully investigated under option by a number of experts who studied its working in the refinery in Norway, and reported favorably upon it as an efficient process for Sudbury ores adapted to operation in Canada. By agreement, dated December 12th, 1912, with the Norwegian owners, the exclusive rights for North America in the patents and processes were granted to Pacific Securities, Limited, and on February 27th, 1914, all the rights so obtained were transferred to this company.

The company is incorporated by letters patent under the Dominion Companies Act, dated July 2nd, 1913, with full powers for all primary and incidental purposes connected with the mining, treatment, marketing and sale of ores, minerals, metals and their products, and an authorized capital of \$20,000,000. The whole of the capital has been issued, and \$6,000,000 of 6 per cent. first mortgage bonds, secured by a mortgage to National Trust Company, Limited, has also been issued. Of an authorized issue of \$10,000,000 of 6 per cent. debenture stock, \$3,500,000 has in addition been issued to date, making a total bond and stock liability at present of \$29,500,000. A special Act of the Dominion Parliament (4-5 Geo. V., cap. 132) empowers the company to issue share warrants and redeemable preference shares. A second Act of 1916 (6-7 Geo. V., cap. 57) authorizes a board of twenty directors, if desired,



**E. P. MATHEWSON.**  
General Manager British America Nickel Corporation.

and provides that the majority of directors shall be British subjects. No share warrants or preference shares have as yet been issued.

The promoters were engaged in financing the enterprise in London when Dr. Pearson was drowned on the Lusitania in May, 1915. Dr. Pearson's death and the financial stringency following the outbreak of war arrested progress for a time, but the negotiations in London were subsequently resumed by his associates and brought to a successful conclusion. The company was so fortunate as to secure the material co-operation of the Imperial Government, in the form of substantial advances in money and a long term contract for a large annual supply of nickel from its Canadian works. It is understood that \$3,000,000 of bonds, or one-half the total issue, and \$14,500,000 of the \$20,000,000 of



the issued capital stock are held in trust by the Public Trustee for the Imperial Government. The shareholders of the Kristianssands company, which has been operating the Hybinette process in Norway, have considerable holdings of the stock, and, with this exception, the whole of the capital stock and of the securities is held by British subjects.

The first intention of the company was to follow the plan of its vendors, and build its smelter at the Whistle mine as the main source of its ore supply. The prospecting of the Murray properties disclosed such large reserves, reported at 8,500,000 tons of ore, which is said to be increasing in quantity and improving in nickel contents with depth, that it was decided to locate the smelter plant at this point, which has other advantages for the purpose. There is railroad connection with the main line of the Canadian Pacific Railway



**E. HIBBERT.**  
Mine Superintendent British America Nickel Corporation.

and with the Algoma Eastern Railway, the benefits which will be derived from the proximity of the town of Sudbury. Until quite recently, the company contemplated locating its refinery at some other point in the province convenient to electric power, probably in the Welland or Niagara district, but it has now been decided to build both the smelter and refinery side by side on a site about a mile south of the Murray mine. There is a force of men at work preparing the site for this plant. The specifications and estimates for buildings and machinery are being prepared, and tenders will be called for shortly.

The critical question of power supply has not been definitely settled at this date, but the officials of the company have had conferences with the municipal council and board of trade of Sudbury, from which

they report that encouraging advance has been made towards procuring the necessary power from the French river through the Ontario Hydro-Electric Commission. The negotiations contemplate the supply to the company of 8,200 horsepower for the first unit, with further supply to be provided within a year from the commencement of operations for the additional units that will be required. If the necessary arrangements to that end are concluded, the company will rely on the town of Sudbury to supply the housing for its employees, and provision has already been made for transporting the operatives from the town to the mine and plant when operations are commenced. There are 50 men working at the Murray mine, in which the shaft is down 700 ft., and when the limit of the present equipment is reached, a hoisting engine driven by electricity, together with the rock house and sorting plant, for which plans have been prepared, will be installed. It is said that diamond drilling has proved approximately 12,000,000 tons of nickel-copper ore on the several properties, and that when the plant is completed the works and properties of the company will represent an investment of \$10,500,000. The amount to be expended in plant and machinery is given as between \$4,000,000 and \$5,000,000 and the company expects to produce 6,000 tons of refined nickel a year.

The officers of the company are as follows: President, James H. Dunn; vice-presidents, J. Frater Taylor, W. A. Carlyle; secretary-treasurer, W. H. Coade; general manager, E. P. Mathewson; directors, Alan Garret Anderson, H. Malcolm Hubbard, London, England; Admiral Borresen, Sam Eyde, V. N. Hybinette, Norway; E. R. Wood, J. S. Lovell, Robert Gowans, R. Home Smith, Toronto. The president is a Canadian capitalist residing in London, England. Mr. Carlyle, late professor of metallurgy in the Royal School of Mines in London, was for some time manager of the Rio Tinto copper mines in Spain. Mr. Mathewson was manager of the reduction works of the Anaconda Copper Mining Company until his connection with this company. Both are Canadians by birth, and Canadian metallurgy is fortunate in receiving this accession of administrative and technical skill.

Supplementing the information contained in the report of the Nickel Commission is the following from the "Sudbury Mining News" account of a meeting held in Sudbury on April 16th, 1917:

The question of the extension of time to the Sudbury Flour Mills Company in regard to the maintenance of their temporary power line running through the town from the substation of the Wahnapiatae Power Company to the flour mills, or the removal of the said line to a location outside of the town, discussed at the last regular meeting, came again prominently before the board of Monday night, when President Carlyle and General Manager Mathewson, of The British America Corporation, and President Mather, of The Sudbury Flour Mills Company, were present and delivered short addresses on the subject.

Mr. Mathewson said in part:

You may be surprised that the British America Corporation has not done more to have the Hydro-Electric Power in Sudbury. But we found that guarantees would have to be given to The Hydro-Electric Commission against losses to the commission. The Federal Government had refused to furnish the guarantees asked for. The British Government, with whom the British America people are under contract for the supply of



nickel products, was then consulted with, and they agreed to furnish the required guarantees during the period of the contract; but these guarantees had not yet arrived. The British America Corporation had strong hopes of the guarantees arriving at any time now, when the full energies of the corporation would be set in motion for a move forward.

"At any rate, the British America people were going right ahead with their work of development," Mr. Mathewson continued. At first it had been intended to start with one unit on a basis of 5,000 tons per annum, but now it had been decided to go in on a larger scale. Two units instead of one would be employed, with double the tonnage per annum. Diamond drilling would be in operation this week, and other mine development work was proceeding satisfactorily. They were employing 130 men at the mine at the present time, but eventually The British America would have a force of fifteen or sixteen hundred men engaged at the works. They intended that these men should live in Sudbury, and they would be looking to the town for assistance in providing the men and their families with houses and homes.

#### PACIFIC COAST COAL MINES, LTD.

At the annual meeting of the Pacific Coast Coal Mines, Ltd., held in Victoria, British Columbia, last month, directors were elected for the ensuing year, as follows: Mr. James Carruthers, Montreal; Mr. J. H. Paine, Montreal (presently of Victoria); Sir Thos Tait, Montreal; Mr. C. A. Barnard, K.C., Montreal; Mr. A. E. Plummer, Vancouver, B.C.; Mr. Paul Galibert, Montreal; and Mr. Talbot Schmuck, Victoria. At a subsequent meeting the new board appointed the following officials: President, Mr. James Carruthers; vice-president and managing directors, Mr. J. H. Paine; secretary-treasurer, Mr. Talbot Schmuck.

The company, which owns and operates the South Wellington and Morden collieries, both situated a few miles south of Nanaimo, Vancouver island, B.C., reports a healthy demand for coal with a decided tendency for the market to broaden, the feeling being that conditions should in the current year show a very satisfactory improvement over those of the past few years.

#### HILLCREST COLLIERIES.

At the annual meeting of the Hillcrest Collieries, held in Montreal, Quebec, the annual statement was presented. This showed that net profits, after deducting all charges, were 2.5 per cent. on the common stock, as compared with 3 per cent. the previous year. The total operating profit, including miscellaneous income, amounted to \$91,257, as compared with \$95,706 in 1915, there having been a decrease of \$4,449. Bond interest at \$16,250 and preferred dividends at \$49,399, were unchanged. Net profits were \$4,449 less than in 1915, the amounts for the two years having been \$25,608 in 1916 and \$30,057 the year before. The amount written off the rest and contingency account was \$15,000, whereas no corresponding deduction was made in 1915, and notwithstanding this there was added to Profit and Loss the sum of \$10,608 as compared with \$30,057, the decrease having been \$19,499. The amount at credit of Profit and Loss at the end of the year was \$170,617, against \$160,009 brought forward at the end of the last year, and \$129,952 at the end of 1914. The company's colliery is situated a short distance east of Frank, in Southwestern Alberta.

#### PASSING OF THE B. C. COPPER CO.

On April 5th, the Greenwood Ledge published the following news paragraph: "The Canada Copper Corporation, Limited, N.P.L., on April 1st purchased the properties and other assets, and has assumed all liabilities and other obligations, of the British Columbia Copper Co., Ltd. The Canada Copper Corporation, Ltd., will continue the mining and smelting operations of the British Columbia Copper Co. in British Columbia under their existing organization."

This final outcome of the relations between the two companies will not surprise those at all familiar with the financial position of the British Columbia Copper Co., for in the balance sheet of the Canada Copper Corporation, as of December 31st, 1915 (the corresponding statement for last year has not yet been received), that company's assets were shown to include "Investment, B. C. C. Co. stock, \$3,000,000," and "Notes receivable, secured by mortgage, \$460,000," the latter being a liability of the British Columbia Copper Co. to the Canada Copper Corporation.

In the summer of 1896 the late Col. John Weir, of New York, and Mr. Frederic Keffer, who had been connected with the Ohio State University up to a year or two before that time, arrived in the Boundary district, the Colonel representing himself and friends prepared to put money into mining ventures in that part of British Columbia. Three properties were bonded for as many syndicates, and Mr. Keffer was left in charge of preliminary exploration work. The bond on the Big Copper, in Copper camp, six miles west of Greenwood, was not taken up, but work on the Mother Lode, in Deadwood camp, three miles from Greenwood, disclosed the occurrence of a big body of copper ore, so that the Boundary Mines Syndicate acquired this property. The third venture was the No. Seven, in Central camp, two or three miles southeast of Boundary Falls; eventually the No. Seven Mining Co. was organized and it developed a vein of gold-quartz ore, but by reason of lack of capital operations were not continued and finally the Consolidated Mining and Smelting Co. bought this property and for several years worked it for the ore suitable for metallurgical purposes at the Trail smelter obtainable from it.

The Mother Lode, however, was the "big bonanza" of the three, and it was in the spring of 1897 that the writer of these notes paid his first visit to it, in company with Mr. Keffer, who had by that time driven an adit 185 ft., through an orebody for about 140 ft. of that length. The course of the adit, however, having been diagonally across the orebody, it was estimated that the right-angle width of the ore was something more than 100 ft.

Adjacent claims having been secured, Mr. Keffer's New York principals in March, 1898, organized the British Columbia Copper Co., Ltd., under the laws of West Virginia, with an authorized capital of \$3,000,000 in shares each of \$5 par value. It is remembered that this company was the first to put in a power plant of considerable size and capacity in Boundary district, and the freight charges on that plant and machinery from Marcus, Washington, on the Spokane Falls and Northern railway, to the mine in Deadwood camp were heavy indeed. Later, a much larger plant was installed and the writer was present at the starting of the



big compressor (supplied by the Jas. Cooper Mfg. Co.) that, with the large steam hoist, was then the pride of that part of the Boundary district.

An enormous quantity of ore having been first exposed, and a big "glory hole" opened for the expeditious and economical mining of the ore, smelting on a comparatively large scale quickly became the largest industry in that neighborhood. The company's smelting works at Greenwood were designed and constructed in 1899-1900 by Mr. Paul Johnson. They were planned with a view to eventual enlargement to a maximum treatment capacity of about 1,800 tons of copper ore a day. Their capacity, with the two first-constructed blast furnaces operating, was between 700 and 800 tons a day. The first furnace was blown in on February 17th, 1901, and construction of the second was completed in the earlier half of 1902. A Bessemerizing plant was added in 1904, this having been designed and installed by Mr. J. E. McAllister, who in 1903 succeeded Mr. Paul Johnson as superintendent of the smelting works. In 1907 the plant was remodelled, with an increase to a smelting capacity of 1,700 tons a day, and in 1910 there was a further enlargement to the present treatment capacity of 2,200 tons a day. After Mr. Keffer had been acting manager for a while, on Mr. McAllister's retirement, Mr. Oscar Lachmund, the present general manager for both the B. C. Copper Co. and the Canada Copper Corporation, was appointed, Mr. Keffer resuming his duties of geologist and engineer to the company.

#### Canada Copper Corporation.

The Canada Copper Corporation was organized in March, 1914, with an authorized capital of \$5,000,000, divided into 1,000,000 shares of \$5 par value. At the time of the organization of the company the issue of \$1,000,000 six per cent. convertible debentures was authorized, and under the plan of organization, shareholders in the British Columbia Copper Co. were invited to subscribe for the debentures and at the same time to exchange their shares for shares in the Canada Copper Corporation. The last published balance sheet of the latter company showed that debentures of a total value of \$600,000 had been issued.

For years Mr. Keffer had been giving attention to the prospective ore resources of Copper mountain, within a dozen miles of Princeton, Similkameen. The British Columbia Copper Co. about a dozen years ago acquired an interest in the Sunset mine, in that neighborhood, and did some development work in it, but at that time the district was without railway connection, and operations were discontinued. Several years ago, however, Mr. Keffer succeeded in inducing his company to take an option of the Voigt copper property, in the neighborhood of Copper mountain, and later to bond a number of claims on the mountain. The eventual exhaustion of the ore deposits on the company's Mother Lode group and other properties near Greenwood it had been operating, having been foreseen, efforts have been largely concentrated on the development of the Copper Mountain claims, of which a large group, not including the Voigt property the purchase of which was not gone on with, has been secured and diamond drilling and underground mining have developed ore to an estimated total quantity of 10,000,000 tons or more, this including "probable" and "possible" ore.

Doubtless the Canada Copper Corporation will marshal all its resources with the object of turning to profitable account the big reserves of copper ore extensive exploration has indicated occur there. Much more money will be required to be expended before it will be practicable to obtain a large return from this source, there being needed further development work, provision of power and ore reduction, transportation, and other requisite facilities, but it may be expected that having gone thus far, the Canadian Copper Corporation will carry its enterprise to a successful issue. Meanwhile it is "vale British Columbia Copper Company" with much regret, which many old Boundary district residents will sincerely share.

#### OBITUARY.

Among the Canadians who fell in the battle for Vimy Ridge was Gunner Fred Hore, brother of the editor of the "Canadian Mining Journal." Gunner Hore enlisted in August, 1914, and during the past two years had been through many battles, from St. Julien



to the Somme, without injury. He died of wounds at a casualty clearing station on April 10th, 1917, the day after the launching of the attack on Vimy Ridge.

Mr. Hore was born in Hamilton, the youngest son of the late Frank Hore, of F. W. Hore & Sons, Hamilton. He is survived by a sister and two brothers.

A new permanent camp is to be established at Ikeda bay, Moresby island, of the Queen Charlotte Group, for the men to be employed at the Ikeda copper mine. It is reported that it is planned to erect a two-storey bunkhouse to provide accommodation for about 100 men, a cookhouse, three cottages, blacksmith shop, powder-house and other buildings, the estimated cost to be about \$10,000. A short time ago the mine was visited by Mr. W. G. Norrie, superintendent of the Silver Standard mine, near Hazelton, Omineca mining division, who is to direct mining work at the Ikeda.



## SPECIAL CORRESPONDENCE

### NORTHERN ONTARIO.

#### Hollinger.

If present plans of the Hollinger Consolidated Mining Company at Porcupine are brought to a successful conclusion, the big mine's capacity will be increased by 1,000 tons per day by the latter part of June. The capacity of the mill at the present time is a little less than 1,800 tons per day of twenty-four hours. The net profits from the treatment of Hollinger ore run close to \$4.50 per ton. With the mill treating 2,800 tons per day, or 80,000 tons every four weeks, the net profits should be \$360,000. When the installation of the present addition of 1,000 tons per day to the plant is completed, it is the intention of the company to add still another 1,000 ton unit to the big mill, which, when completed would raise the capacity to 3,800 tons per day and allow of the treatment of 100,000 tons per month, which would provide a net profit of \$450,000 every four weeks. This would show a surplus of over \$200,000 above dividend requirements on the old basis of 1 per cent. every four weeks. This tremendous profit would aggregate \$5,850,000 per annum, and would provide a surplus over dividend requirements at the rate of 1 per cent. every four-weekly period, or \$2,652,000 per annum.

At present, shortage of labor makes the early realization of Hollinger plans unlikely. Gross profits for the four weeks ended March 25th were \$210,749.

#### Davidson.

It is considered by the Davidson Porcupine Mines Company, that the developments at the 300-ft. level warrant the installation of a mill and plans for same are being considered. Vigorous drilling operations will be carried on from the 300-ft. level. The first hole was started last week and should encounter the ore-body located on the 300-ft. level at about the 500-ft. depth. A crosscut has been driven to the north and a station cut at the extreme end of same to allow of drilling operations being carried on under present workings. It is said that 5,000 ft. of diamond drilling will be done, and the holes will be sunk at various angles and to different depths. By this method the company will prove their property at depth with the least possible delay.

#### Boston Creek.

Interests closely associated with the Boston Creek Mines at Boston Creek, have acquired an option on the Giovinazzi claims, which tie on to the Boston Creek mining claims at the north of their property. A number of good veins have been uncovered on the Giovinazzi claims from time to time and it is understood a number of these veins carry free gold.

#### Porcupine V. N. T.

Developments at the Porcupine V. N. T. are being prosecuted with all possible speed. The main shaft, which is on the North Thompson side of the property, is down six hundred feet and has been timbered all the way. At this point a large station has been cut and a crosscut has cut the main vein about 50 ft. from the shaft. The vein will be drifted on to a point under the winze on the Vipond property, where a raise will be made to connect with the winze. This will add more than one advantage to the mine, providing better ventilation and at the same time developing a large amount of ore. The length of this drift will be approximately 900 feet. The ore from this working will be

hoisted on the North Thompson side of the property and trammed over to the mill on the Vipond side, a distance of about 800 ft. It is reported that the mill, which now has a capacity of 140 tons per day, will perhaps be increased in the near future. All ore going to the mill at the present time comes from the dump on the North Thompson property, and it is estimated that there is enough ore in this dump to keep the mill running for a period of three months without raising any more from underground. There is a large amount of ore blocked out underground on the property. A temporary suspension of underground work was necessitated by lack of power recently, but this difficulty has now been overcome.

#### Gowganda.

The work of construction on the dam at Hangingstone Falls is being rushed with all possible speed, in an effort to get the work sufficiently far ahead to meet the spring break-up. The South Bay Power Company has twelve teams hauling material and supplies in over the Elk Lake-Gowganda road. The recent cold weather has greatly increased the chances of the company to be in a position to contend with the spring flood. The work of driving the 6,500-ft. tunnel, it is understood, will be left until early in the summer.

#### Wisconsin.

The plant for the Wisconsin Mining Company in Skead township, has arrived at the property, being taken in over the twenty-six mile road from Englehart. It is the intention of the management to wait until the frost is out of the ground before commencing the erection of the plant.

#### Power Trouble Over.

The March output of the Porcupine mines will show some falling off, owing to trouble at the power house on the Matagami river, caused by the break-up of the ice. The trouble has been overcome, however, and the supply of power is again ample. Some idea of the importance of this power supply to the Porcupine mines may be realized when it is known that the Hollinger alone requires about 5,000 horsepower to run the mine.

#### Sesekinika.

The Sesekinika Gold Mining Company, in Maisonville township, is meeting with good results in the development of the property. A number of narrow veins have been encountered and test pits sunk, with the result that some spectacular showings of gold are to be seen. The coming summer will see considerable activity in this section of the gold area, stimulated by the results obtained on this property.

#### Night Hawk.

The Porcupine Night Hawk Mining Company, in the township of Cody, has installed a small plant, consisting of two boilers and a compressor, which is now in operation. Sinking from the 50-ft. level of the old shaft is being continued. This property is located about two miles from Gold Island, which was discovered the year before the rush to Porcupine, and was the lode-stone which drew prospectors in the direction of Porcupine lake at that time.

#### Slade-Forbes Asbestos.

Plans are under consideration for the installation of a small mill at the Slade and Forbes Asbestos Mining Company's property in Deloro township. While results at the mine have been very satisfactory lately,



it has been found to be unprofitable to ship the ore out of the country for treatment. In the meantime work at the property has been discontinued.

#### **Boston Creek.**

About forty men are at present employed on the Boston Creek property at Boston Creek, and it is understood that this staff will be materially increased in the near future. The building operations to accommodate a larger number of men are almost completed. The winze which was reported recently to have reached the 300-ft. level will be continued to the 400-ft. at once. Results are said to be very encouraging.

#### **Miller Independence.**

Underground work at the Miller Independence at Boston Creek is to be speeded up to meet the requirements of the new ball mill which is being installed at the present time. It is anticipated the company will be treating about thirty tons per day by the first of July. This is the first mill to be installed in the Boston Creek district, and results will be watched with more than usual interest.

#### **A Record Shipment.**

A record for a single car of ore sent out from the Cobalt camp was recently made by the Mining Corporation of Canada. The car contained 67,462 pounds of ore from which 241,431 ounces of silver were recovered. With the price of silver above 73 cents per ounce, the shipment had an approximate value of \$177,000. This works out at the rate of 7.157 ounces to the ton of ore.

#### **McIntyre.**

Owing to power troubles the McIntyre production for month of March although the highest in the mine's history did not come up to expectations. The mill treated 14,377 tons of ore from which \$147,795 in gold was recovered. The mill heads were slightly above the average at \$10.82 per ton. The mill ran slightly more than three quarters of capacity averaging 464 tons of ore per day. Not more than 54 cents per ton was lost in the tailings. Power difficulties have been overcome and it is anticipated that the April production from the mine will constitute a record. The plant is now running at capacity and treating well over 500 tons per day. Development work at the 1,000-ft. level of the property proves the orebody at this depth to be one of the largest and highest grade bodies in the Porcupine Camp. The drift is already nearly 1,000 feet long, with an average width, so far determined, of twenty-six feet which has a gold content of over \$16 per ton. The vein is located in the basaltic schist in the north contact of the Keewatin and porphyry formations. This contact extends for a distance of one mile over McIntyre property and southwest into Hollinger. It is along this contact that much Hollinger ore is being mined.

#### **Schumacher.**

Material for the new mill addition to the Schumacher at Porcupine, which is to be a duplicate of the unit of 140 tons capacity already in operation, is now on the ground. Orders for the machinery have been let, but construction will not begin until all details are complete. Twelve machines are working on underground development at the present time, eight are breaking down ore and four are working on exploration and development. Costs during the year have averaged \$4.30 per ton with an additional 40 cents per ton for mint charges. When it is known that Schumacher ore has been of an average grade of \$6 per ton it will be plainly seen that the company has only a small mar-

gin of profit. During March 3,400 tons of ore was treated and a net profit of \$3,500 shown. With pre-war conditions prevailing the Schumacher could make handsome profits on its \$6 ore; but under present conditions, there is very little encouragement to operate this property. The vein a few feet north of the No. 4 shaft was recently cut at the 300-ft. level and the diamond drill core proved the existence of a vein eleven feet in width, with higher values than the average of the mine. The diamond drilling has been discontinued for the time being.

#### **Kenogami.**

The machinery for the small steam plant at the Lucky Baldwin property, near Kenogami station, is now on the ground and will be installed at an early date. The shaft is now down seventeen feet and considerable free gold has been encountered in the main vein which is three feet in width and well defined. Gold values are also found in a number of stringers running off from the main vein and it is thought likely the orebody will widen out with depth. It is the intention of the company to sink to the 300-ft. level as soon as possible. Fifteen men are employed at the mine.

#### **Peterson Lake.**

The first quarterly statement of the Peterson Lake Mines at Cobalt since the new management took hold of the property was not a very satisfactory one from the viewpoint of the shareholder as it was found advisable to pass the regular dividend. The year's report by Mr. Frank Loring, held many optimistic views regarding the possibilities of the mine. Owing to certain portions of the workings being filled with water it was impossible for him to make a complete statement of the conditions. Mr. Loring advises putting a number of raises to the surface on the veins close to the Nova Scotia line where he thinks silver in commercial quantities will be found, as has been the case in similar formations on the Nova Scotia. Mr. Loring holds the opinion that the ground formerly held by lease by the Little Nipissing Mining Company and that south and between the Little Nipissing and Seneca Superior lease gives the best chances for encountering new orebodies and remarks that they have been explored very little. He also advocates ascertaining the depth of the upper diabase. Owing to the results obtained on the lower diabase sill at the Beaver property it is thought probable that the veins on the Peterson Lake will show silver values sufficient to warrant the expenditure. Mr. Loring advises diamond drilling to discover the depth of the lower contact, and, if not too deep, sinking a shaft and exploring beneath the sill. The company has paid \$462,191 in dividends. Mr. S. G. Forst is managing director and Mr. W. A. Lamport secretary-treasurer.

#### **Beaver.**

The annual report of the Beaver bears out the opinions previously expressed of the importance of the finds made at the 1,600-ft. level of that property, although Mr. Culver says: "While we are not yet in a position to say it will make a new mine out of Beaver, it is most encouraging. The report on developments at the Kirkland Lake Mine was very satisfactory. Enough ore has been stoped out at the different levels to keep a mill of 100 tons daily capacity going without any trouble, and it is likely the mill will be installed in the near future at this property. The financial statement showed assets consisting of cash and accounts receivable of \$57,924, against which are liabilities of \$6,500, leaving a surplus of \$51,424.



**Wright-Hargraves.**

It is understood that in cutting a station at the 100-ft. level of the Wright-Hargraves at No. 2 shaft, the vein was found to be 20 ft. in width, and carried values around \$50 to the ton. No. 2 and No. 3 shafts will be continued to the 300-ft. level without delay and a drift will be run to make a connection which will serve the double purpose of proving a very large ore body and at the same time provide excellent ventilation. An extensive plan of development is being outlined for this property.

**Adanac.**

Silver values are increasing slightly on the vein at the 400 foot level of the Adanac and the vein appears to be coming together more definitely, with every indication that it is nearing the contact where a change for the better is confidently anticipated.

**Kerr Lake.**

During March the Kerr Lake Mining Company silver production amounted to 219,335 ounces, as compared with 206,474 ounces during the preceeding month. This is the highest production since August last. The production for the first quarter of 1917 is 641,000 ounces as compared with 563,594 for the first quarter of 1916, an increase of 77,421 ounces. The Kerr Lake total production for 1917, at the present rate, will compare favorably with 1916.

**Teck-Hughes.**

Precipitates from the new mill at the Teck-Hughes are being shipped to the Buffalo mine refinery for treatment until such time as arrangements can be made to care for them at the property.

**Dominion Reduction.**

The Peterson Lake Company has secured an injunction restraining the Dominion Reduction Company from taking tailings from Peterson Lake. Meanwhile, the second oil flotation unit at the Dominion Reduction, which, it is understood, was being installed for the purpose of treating these tailings, is being gone on with.

**Canadian Kirkland.**

Free gold has been discovered in a three foot vein on the property of the Canadian Kirkland Company, at Kirkland Lake. A small force are employed and the initial program will consist of more or less surface exploration.

**BRITISH COLUMBIA.**

One of the most important questions at present affecting the mining industry of the Kootenay and Boundary districts of British Columbia is that of the lack of agreement up to the time of writing between the Western Coal Operators' Association and District 18, United Mine Workers of America, which union controls the greater number of the miners working under ordinary conditions in the Crows Nest district of British Columbia and in the Province of Alberta. There is, though, hope of an early settlement of the differences between operators and employees, for on April 14, the following press despatch was sent out from Calgary, in which city representatives of the two parties have been conferring off and on for several weeks:

"The dispute between the miners and the managers of the coal properties in District No. 18 has been settled, at least so far as the sub-committees are concerned. Early next week the agreement reached between the sub-committees will be presented to the

union miners of the district for an expression of approval by ballot, and if this be favorable to the settlement reached by the committee-men, the mines will enter into another period of peaceful operation which should last for two years.

"The wage increase agreed upon approximates 15 per cent. The eight-hour day for outside men, demanded by the men in the original presentation of claims, has been compromised, the terms providing for a nine-hour day for most of the outside men. The present outside day is of ten hours' duration. There was also a compromise on the holiday demand, both operators and men conceding some points.

"The provisions of the agreement include the possibility of further demands being made before the expiration of the working agreement, but only in case of extraordinary conditions with relation to the war or the cost of living."

**Quarter's Ore Receipts at Trail.**

The total quantity of ore received at the Consolidated Mining and Smelting Co.'s smelting works at Trail, West Kootenay, during the first quarter of 1917 was 121,516 tons. This quantity compares with 118,415 tons for the corresponding period of the year 1916. The districts or divisions from which the ore came, and their respective proportions, are as follows, the figures in parentheses being the quantities for the similar period of last year:

From East Kootenay, 35,226 tons (16,856 tons). From West Kootenay: Ainsworth division, 2,121 tons (5,212 tons); Slocan division, 5,240 tons (3,195 tons); Nelson division, 2,906 tons (708 tons); Trail Creek (Rossland) division, 41,762 tons (84,994 tons); Arrow Lake division, 155 tons; Lardeau and Trout Lake divisions, 95 tons; Revelstoke division, 40 tons (60 tons); total for West Kootenay district, 52,319 tons (94,169 tons). From Boundary district, 12,816 tons (75 tons). From Yale district: Nicola division, 343 tons; Kamloops division, 1,339 tons (738 tons). From Coast district: New Westminster division, 38 tons; Vancouver Island, 62 tons. From Omineca division, in the Skeena River region, 266 tons (189 tons). From Alberta, 40 tons (52 tons). From Manitoba, 30 tons. From Ontario, 974 tons. From the United States: Idaho, 2,153 tons (126 tons); Washington, 15,845 tons (6,210 tons). From China, 65 tons.

British Columbia mines sent to Trail during the quarter under review 102,409 tons (112,027 tons); those from other parts of Canada, 1,044 tons (52 tons); those in neighboring States, south of the International Boundary Line, 17,998 tons (6,336 tons), and one mine in China sent 65 tons. The proportion of the quarter's total from mines operated by the Consolidated Mining and Smelting Co. was 85,564 tons (100,422 tons), and of custom ores, 35,952 tons (17,933 tons). The main cause of the decrease in quantity of ore from the company's own mines was the carrying out of its policy of mining and smelting less ore from its Rossland mines, the chief valuable content of that ore being gold, the production of which has been costing more without any compensating increase in value. The decrease in production from Rossland mines, however, was to a considerable extent compensated for as regards quantity of ore received at Trail, by a comparatively large increase in output of lead and zinc ores from the company's Sullivan mine, in East Kootenay. The decrease in quantity of ore received from Ainsworth was due chiefly to the fact that the company's No. 1 mine, in that camp, which in the first quarter



of 1916 shipped 2,381 tons, has been inoperative this year. On the other hand, the increase from Boundary district is the outcome of production from the Emma mine which, prior to its acquirement by the Consolidated Co., was idle for several years.

#### The Position at Rossland.

On Monday, April 2, the Rossland Miner published the following reference to miners and others affected by the recent suspension of work at the Consolidated Co.'s Centre Star and Le Roi groups of mines in Rossland camp:

"Those miners and other employees in the mines here who have been laid off on account of the restricted operations at the smeltery at Trail, caused by the shortage of the supply of coke, as announced by the Consolidated Mining and Smelting Company recently, were paid off today.

"Just what the men will do pending an adjustment of the troubles prevailing at present is not known, some having gone to Kimberley, East Kootenay, or other places, until a full resumption of work shall take place in the local mines. Few, if any, of the families of the workmen have left Rossland, and it is sincerely hoped by all that everything will be normal again very soon and that the workmen will be employed as usual.

"No adjustment of the differences between the miners and coal-mining companies in the Crowsnest coal section, from which the supply of coke is received for the Trail smeltery, has as yet been announced, but when this shall come no doubt something definite as to a complete resumption of work here will be known.

"The Le Roi No. 2 (Josie) mine still continues to be operated, but unless relief shall come, through a better supply of coke for the smelting works, it is feared that the Josie, too, may be adversely affected."

While the Rossland Miner does not mention the wages question, it is known that the prospect of the miners throughout the district demanding an increase of 50 cents a day in wages, it having been currently reported that such was their intention, was one of the causes that led to the suspension of operations at the Consolidated Co.'s Rossland mines.

#### Omineca.

From New Hazelton has come the news that owing to an increase in ore-treatment charges at the Trail smelting works and a refusal to accept for smelting there silver-lead ore containing more than 15 per cent. zinc, shipment of that class of ore from the Silver Standard mine, on Glen mountain, a few miles from Hazelton, has been suspended. An official statement published a few weeks ago was that in 1916 about 651 tons of silver-lead ore was shipped to Trail from this mine, the total metal contents having been about 120 oz. of gold, 74,593 oz. of silver, and 162,051 lb. of lead; also, that 209 tons of zinc-silver ore was shipped to the United States, this having contained 168,816 lb. of zinc and 12,647 oz. of silver.

An adit on the Silver Standard property crosscuts four or five veins, which are roughly parallel. All these veins are more or less mineralized and will, in time, be prospected by drifting on them. The main vein contains a considerable amount of ore which cannot be shipped profitably as mined, nor would it pay to hand-sort it, but it would be amenable to some kind of concentration. It is probable that after much more ore shall have been developed, sufficient to assure a large enough quantity to warrant the provision of concentrating facilities, a suitable mill will be put in.

#### General Notes.

Correcting a misstatement made in a New York technical journal, Mr. Joseph Keele, chief engineer in the Ceramic Division, Mines Branch, Canada Department of Mines, has stated in print that "some of our best fireclays occur in the Tertiary rocks of British Columbia, where they are mined for the manufacture of firebrick."

Last year placer-gold mining was done on a number of streams in Atlin district, including Pine, Spruce, Boulder, and Otter creeks, and O'Donel river, and the amount of gold recovered was estimated to have been of a total value of \$320,000. Preparations are now being made for the season of 1917, and, the winter's snowfall having been heavy, it is hoped there will be a good supply of water for gravel-washing through a long season, with a correspondingly large yield of gold.

Messrs. Sperry and White, of Vancouver, who are connected with the Pacific Great Eastern railway, in course of construction from tidewater on Howe Sound through Lillooet and Cariboo districts to a connection with the Grand Trunk Pacific transcontinental railway at Prince George, are interesting themselves in some very promising mineral claims situated in the mountains at a distance of about 20 miles from Hope, a station on the C. P. R. main line east of Vancouver. Arrangements have been made to do some diamond-drilling to prospect ground that at the surface seems to give indications of the occurrence there of ore in considerable quantity.

It is stated that negotiations have been carried on between the management of the smelting works at Northport, Washington, about twenty miles from Rossland, and the general manager of the West Kootenay Power and Light Company in connection with a proposal that electric current for power purposes shall be supplied by the latter company to the smelting works. A report from Spokane, Washington, is to the effect that if the proposed agreement be entered into, the power company will be required to deliver 2,000 horse-power a year to the smelting company. As yet, though, these statements lack official confirmation.

#### SILVER PRICES.

|              | New York.        | London.          |
|--------------|------------------|------------------|
|              | cents.           | pence.           |
| April 6..... | 73 $\frac{5}{8}$ | holiday          |
| " 7.....     | 73 $\frac{5}{8}$ | holiday          |
| " 9.....     | 73 $\frac{5}{8}$ | 36 $\frac{5}{8}$ |
| " 10.....    | 73 $\frac{3}{4}$ | 36 $\frac{5}{8}$ |
| " 11.....    | 73 $\frac{3}{4}$ | 36 $\frac{5}{8}$ |
| " 12.....    | 73 $\frac{3}{4}$ | 36 $\frac{5}{8}$ |
| " 13.....    | 73 $\frac{5}{8}$ | 36 $\frac{1}{8}$ |
| " 14.....    | 73 $\frac{5}{8}$ | 36 $\frac{1}{8}$ |
| " 16.....    | 73 $\frac{5}{8}$ | 36 $\frac{1}{8}$ |
| " 17.....    | 73 $\frac{5}{8}$ | 36 $\frac{1}{8}$ |
| " 18.....    | 74               | 36 $\frac{3}{4}$ |
| " 20.....    | 74 $\frac{7}{8}$ | 37 $\frac{3}{8}$ |

#### TORONTO MARKETS.

Cobalt oxide, black, \$1.05 per lb.  
 Cobalt oxide, grey, \$1.15 per lb.  
 Cobalt metal, \$1.25 to \$1.50 per lb.  
 Cobalt anodes, \$1.50 to \$1.75 per lb.  
 Nickel metal, 45 to 50 cents per lb.  
 White arsenic, 5 $\frac{1}{2}$  to 6 cents per lb.

April 24, 1917—(Quotations from Canada Metal Co., Toronto)  
 Spelter, 13 cents per lb.

## MARKETS

Lead, 12 cents per lb.  
 Tin, 58 cents per lb.  
 Antimony, 36 cents per lb.  
 Copper, casting, 35 cents per lb.  
 Electrolytic, 37½ cents per lb.  
 Ingot brass, yellow, 23 cents; red, 25½ cents per lb.

April 24, 1917—(Quotations from Elias Rogers Co., Toronto)

Coal, anthracite, \$9.00 per ton.  
 Coal, bituminous, nominal, \$8.50.

## NEW YORK MARKETS.

Connellsville Coke—

Furnace, spot, \$8.00.

Furnace, contract, \$7.00 to \$8.00.

Foundry, spot, \$10.00 to \$10.50.

Foundry, contract, \$8.50 to \$9.25.

Straits Tin, spot, f.o.b. nominal, 55.75 cents.

Copper—

Prime Lake, nominal, 31.00 to 32.00 cents.

Electrolytic, nominal, 30.50 to 31.50 cents.

Casting, nominal, 28.00 cents to 28.50 cents.

Lead, Trust price, 9.00 cents.

Lead, outside, nominal, 9.50 to 9.75 cents.

Spelter, prompt western shipment, 9.05 to 9.30 cents.

Antimony—

Chinese and Japanese, nominal, 34.00 cents.

Aluminum—nominal.

No. 1 Virgin, 98-99 per cent., 59.00 to 61.00 cents.

Pure, 98-99 per cent. remelt, 56.00 to 58.00 cents.

No. 12 alloy remelt, 40.00 to 42.00 cents.

Powdered aluminium, 85.00 to 90.00 cents.

Metallic Magnesium—99 per cent. plus, \$2.50 to \$3.00.

Nickel—Shot and ingot, 50.00 cents.

Electrolytic, 55.00 cents.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$113.00.

Platinum (pure), \$105.00.

10 per cent. Iridium, \$110.00.

Cobalt (metallic), \$1.70.

Tungsten, per unit—

Sheelite, \$17.50.

Wolframite, \$17.00.

Silver (official), 74⅞ cents.

Metal Products.—Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

Sheet Copper—

Hot rolled, 42.00 cents.

Cold rolled, 43.00 cents.

(Shipments from stock 2c per pound extra.)

Copper bottoms, 50.00 cents.

Copper in rods (round), 40.00 cents.

Square and rectangular, 41.00 cents.

Copper wire, nominal, 37.50 cents to 38.00 cents.

## STOCK QUOTATIONS.

As of close April 21st, 1917.

(By courtesy of J. P. Bickell & Co., Toronto.)

New York Curb.

|                            | Bid.  | Asked. |
|----------------------------|-------|--------|
| Boston and Montana .....   | .62   | .64    |
| Butte-Detroit Copper ..... | .37½  | .50    |
| Canada Copper .....        | 2.06  | 2.12   |
| Dome Extension .....       | .18   | .20    |
| Hargraves. . . . .         | .15   | .17    |
| Inter. Petroleum .....     | 13.75 | 14.00  |
| Kerr Lake .....            | 4.37  | 4.50   |

|                               |       |       |
|-------------------------------|-------|-------|
| La Rose Con. ....             | .50   | .56   |
| McIntyre. . . . .             | 1.56¼ | 1.68¾ |
| North Amer. Pulp & Paper..... | 5.12  | 5.50  |
| Nipissing. . . . .            | 7.25  | 7.50  |
| Superstition. . . . .         | .36   | .40   |
| Temiskaming .....             | .43   | .45   |
| Vipond .....                  | .38   | .42   |

## Ontario Gold Stocks.

|                          | Bid.  | Asked. |
|--------------------------|-------|--------|
| Apex .....               | .07   | .07¼   |
| Boston Creek .....       | .90   | .92    |
| Dome Extension .....     | .19   | .20    |
| Dome Lake .....          | .19   | .19½   |
| Dome Mines .....         | 14.90 | ...    |
| Hollinger Cons. ....     | 5.10  | 5.15   |
| McIntyre. . . . .        | 1.68  | 1.69   |
| Moneta. . . . .          | ..    | .12    |
| Newray .....             | 1.47  | 1.48   |
| Porcupine Crown .....    | .56   | .60    |
| Porcupine Imperial ..... | .03½  | .03¾   |
| Porcupine Tisdale .....  | .01¾  | .02    |
| Vipond. . . . .          | .40¾  | .42    |
| Preston East Dome .....  | .04½  | .05    |
| Schumacher. . . . .      | .49   | .50    |
| Teck Hughes .....        | .13¼  | .14    |
| West Dome .....          | .23   | .24    |

## Cobalt.

|                               | Bid.  | Asked. |
|-------------------------------|-------|--------|
| Adanac .....                  | ...   | .20    |
| Bailey .....                  | .03½  | .04    |
| Beaver Con. ....              | .37   | .38    |
| Buffalo .....                 | 1.10  | ...    |
| Chambers-Ferland. . . . .     | .10½  | .11    |
| Coniagas. . . . .             | 3.25  | ...    |
| Crown Reserve .....           | .31   | .35    |
| Great Northern .....          | .11½  | .12½   |
| Hargraves. ....               | .16¼  | .17    |
| Hudson Bay .....              | 40.00 | ...    |
| Kerr Lake .....               | 4.30  | ...    |
| La Rose .....                 | .50   | ...    |
| McKinley-Darragh-Savage ..... | .48   | .50    |
| Nipissing .....               | ...   | 7.50   |
| Peterson Lake .....           | .08½  | .09    |
| Shamrock Cons. ....           | .21   | .22½   |
| Temiskaming .....             | .43   | .43½   |
| Trethewey .....               | .11   | .16    |
| Wettlaufer .....              | .06½  | .08    |

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The Company continues the notice of the former owners of these patents that it is ready to grant licenses for the use of this process to those who wish to install and use it in Canada, as well as in other parts of North America.

Notice is hereby given that suit will be brought against infringers to restrain all unlicensed use of the process and to recover all profits acquired by such unlawful use.

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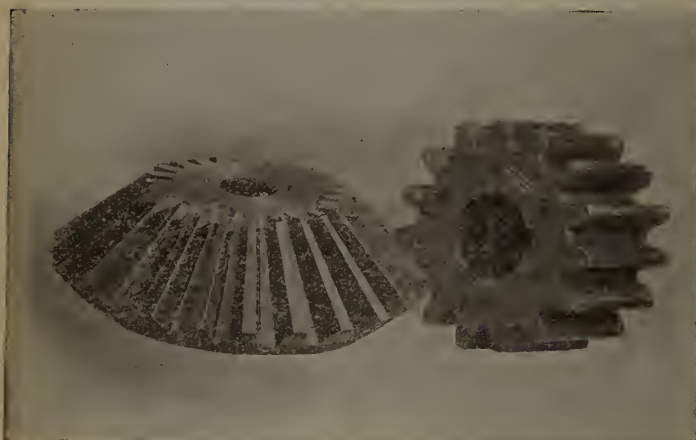
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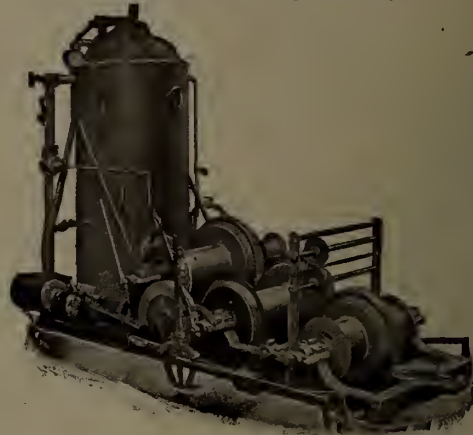


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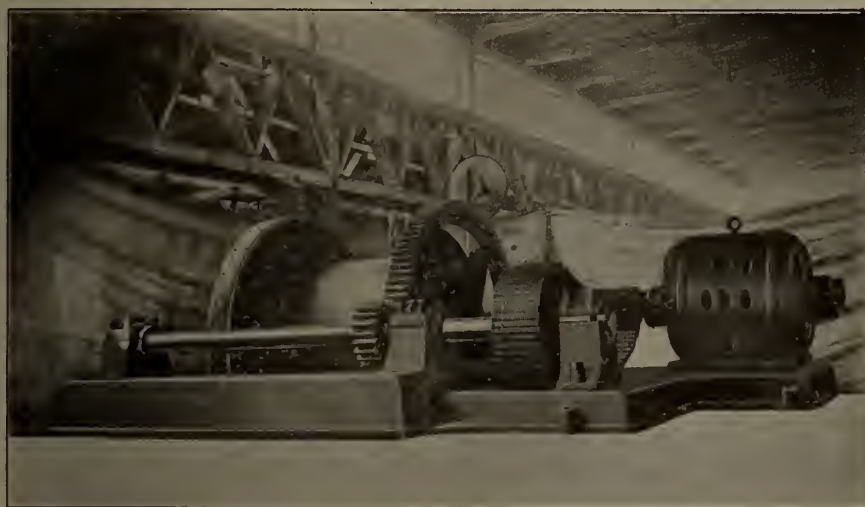
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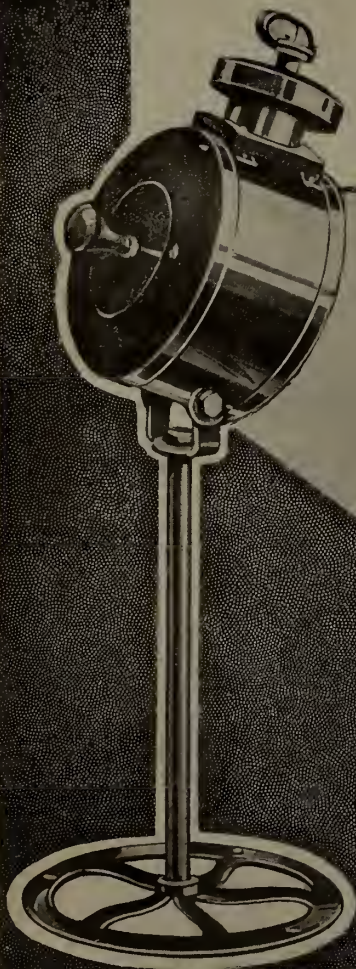
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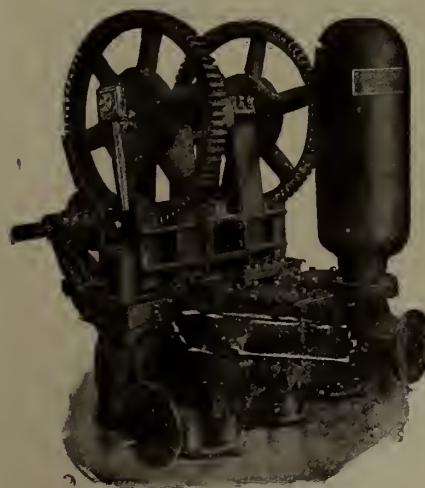
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| MANITOBA:         | -          | -         | -        | -            | - | Winnipeg      |
| ALBERTA:          | -          | -         | -        | -            | - | Edmonton      |
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 James Island, B.C.  
 Bowen Island, B.C.

Windsor Mills, P.Q.  
 Nanaimo, B.C.  
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# The Canadian Miners' Buying Directory.

- Air Hoists—**  
Canadian Ingersoll-Rand Co., Ltd.
- Amalgamators—**  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Antimony**  
Canada Metal Co., Ltd.
- Assayers and Chemists—**  
Milton L. Hersey Co., Ltd.  
Campbell & Deyell, Cobalt.  
Ledoux & Co., 99 John St., New York.  
Thos. Heys & Son.  
C. L. Constant Co.
- Assayers' and Chemists Supplies—**  
C. L. Berger & Sons, 37 William St., Boston, Mass.  
Lymans, Ltd., Montreal, Quebec.  
Stanley, W. F. & Co., Ltd.
- Babbitt Metals**  
Canada Metal Co., Ltd.  
Can. Fairbanks-Morse Co.
- Ball Mills—**  
Fraser & Chalmers of Canada, Limited.  
Hull Iron & Steel Foundries, Ltd.
- Belt—Leather, Rubber and Cotton—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Blasting Batteries and Supplies—**  
Can. Ingersoll-Rand Co., Ltd.  
Curtis & Harvey (Canada) Ltd.  
Northern Canada Supply Co.  
Canadian Explosives, Limited
- Blowers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Bollers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.
- Boxes, Cable Junction—**  
Standard Underground Cable Co. of Can., Ltd.
- Buckets—**  
Can. Fairbanks-Morse Co.  
Hendrick Mfg. Co.  
M. Beatty & Sons, Ltd.  
Northern Canada Supply Co.
- Cable—Aerial and Underground—**  
Fraser & Chalmers of Canada, Ltd.  
Northern Canada Supply Co.  
Standard Underground Cable Co. of Can., Ltd.
- Cableways—**  
Fraser & Chalmers of Canada, Limited.  
M. Beatty & Sons, Ltd.
- Cages—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cables—Wire—**  
Standard Underground Cable Co. of Canada, Ltd.
- Car Dumps—**  
Sullivan Machinery Co.
- Cars—**  
Can. Fairbanks-Morse Co.  
W. Fraser.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cement Machinery—**  
Northern Canada Supply Co.  
Hull Iron & Steel Foundries, Ltd.
- Chains—**  
Can. Fairbanks-Morse Co.  
Jeffrey Mfg. Co.  
Jones & Glasco  
Northern Canada Supply Co.  
B. Greening Wire Co., Ltd.
- Chemists**  
Canadian Laboratories.  
Campbell & Deyell.  
Thos. Heys & Sons.  
Milton Hersey Co.  
Ledoux & Co.
- Coal—**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters—**  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Dock Bridges—**  
Roberts & Schaefer Co.
- Coal Mining Explosives—**  
Curtis & Harvey (Can.), Ltd.  
Canadian Explosives, Limited
- Coal Mining Machinery—**  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.  
Sullivan Machinery Co.
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Sullivan Machinery Co.  
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Jeffrey Mfg. Co.  
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Roberts & Schaefer Co.
- Compressors—Air—**  
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Escher Wyss & Co.  
W. Fraser.  
Smart-Turner Machine Co.  
Fraser & Chalmers of Canada, Limited.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Concentrators and Jigs—**  
Fraser & Chalmers of Canada, Limited.
- Concrete Mixers—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Wettlaufer Bros.
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Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.
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Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
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Can. Fairbanks-Morse Co.  
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Hendrick Mfg. Co.
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Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
M. Beatty & Sons, Ltd.
- Crane Ropes—**  
Allan, Whyte & Co.  
B. Greening Wire Co., Ltd.
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Hull Iron & Steel Foundries, Ltd.
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Lymans, Ltd.  
Jeffrey Mfg. Co.  
Mussens, Limited.  
Hull Iron & Steel Foundries, Ltd.  
Wettlaufer Bros.
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Fraser & Chalmers of Canada, Limited.  
Roessler & Hasselacher.
- Derricks—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.
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Diamond Drill Contracting Co.  
Smith and Travers.  
Sullivan Machinery Co.
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- Dredging Machinery—**  
M. Beatty & Sons.
- Dredging Ropes—**  
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- Drills, Air and Hammer—**  
Can. Ingersoll-Rand Co., Ltd.  
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Sullivan Machinery Co.  
Northern Canada Supply Co.
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Can. Ingersoll-Rand Co., Ltd.  
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Sullivan Machinery Co.
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Sullivan Machinery Co.  
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Sullivan Machinery Co.
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Sullivan Machinery Co.
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- Dynamite—**  
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Can. Ingersoll-Rand Co., Ltd.  
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Alex. Fleck.  
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Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
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M. Beatty & Sons.
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Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.
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- High Speed Steel Twist Drills—**  
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Armstrong, Whitworth of Can., Ltd.
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Mussens, Limited.  
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- Hose—**  
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- Insulating Compounds—**  
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Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
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Hull Iron & Steel Foundries, Ltd.
- Kominturers—**  
Hull Iron & Steel Foundries, Ltd.
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- Link Belt—**  
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Northern Canada Supply Co.  
Jones & Glasco.
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W. Fraser.
- Machinists and Founders—**  
Hull Iron & Steel Foundries, Ltd.
- Metal Merchants—**  
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Geo. G. Blackwell, Sons & Co.  
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Canada Metal Co.  
C. L. Constant Co.
- Monel Metal—**  
International Nickel Co.
- Nickel—**  
International Nickel Co.
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# Ontario's Mining Lands

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Ontario in 1915 produced over 44 per cent. of the total mineral production of Canada, or more than twice that from any other Province. The preliminary report of the Ontario Bureau of Mines shows the output of the mines and metallurgical works of Ontario for the year 1915 to be worth \$57,532,844, of which the metallic production was \$47,721,180. There were 79 producing mines, 62 of which operated at a profit.

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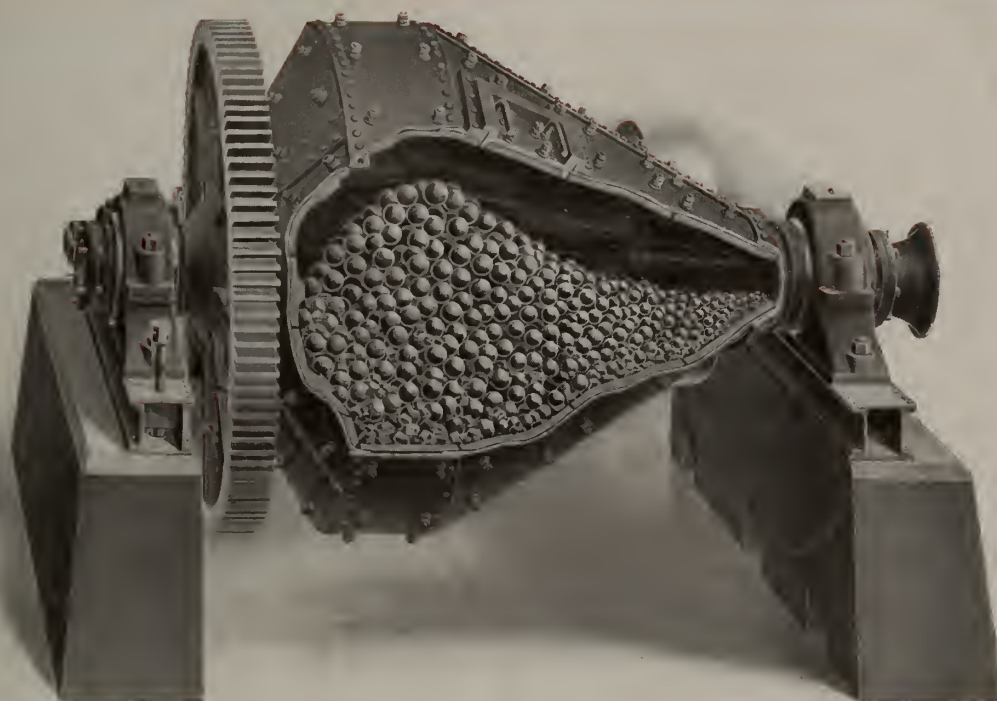


# **CANADIAN** **MINING JOURNAL**

VOL. XXXVIII

TORONTO

No. 10



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### MINES BRANCH

#### Recent Publications

- The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.
- Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.
- Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
- Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.
- Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

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**Ore-Dressing Laboratory.**—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

**Chemical Laboratory.**—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

**Ceramic Laboratory.**—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

**Structural Materials Laboratory.**—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

### GEOLOGICAL SURVEY

#### Recent Publications

- Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.
- Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.
- Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.
- Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.
- Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.
- Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.
- Memoir 81. The Oil and Gas Fields of Ontario and Quebec, by W. Malcolm.
- Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.
- Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.
- Memoir 85. Road Material Surveys in 1914, by L. Reinecke.
- Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.
- Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.
- Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.
- Ontario. Topography.

Map 59A. Wheaton, Yukon Territory.

Map 66A. Brechin Sheet, Ontario and Victoria Counties.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

Map 153A. Asquith and Churchill Townships, Sudbury District, Ontario.

Map 158A. Nanaimo Sheet, Vancouver Island, British Columbia.

Map 175A. Ymir, Kootenay, British Columbia.

Map 181A. Wood Mountain-Willowbunch Coal Areas, Saskatchewan.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

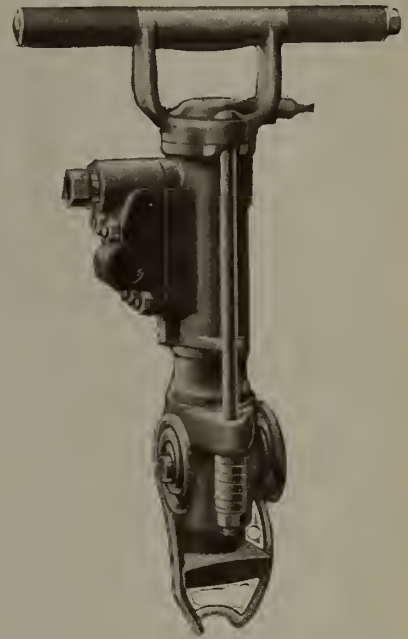
The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

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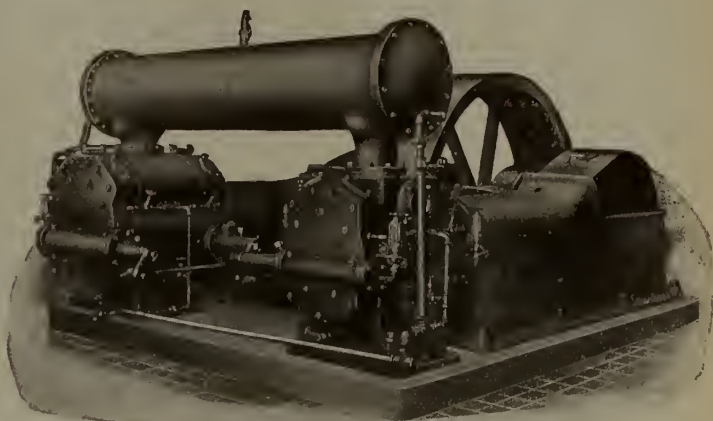
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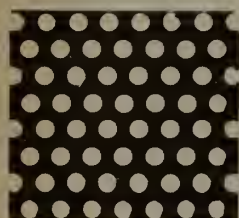
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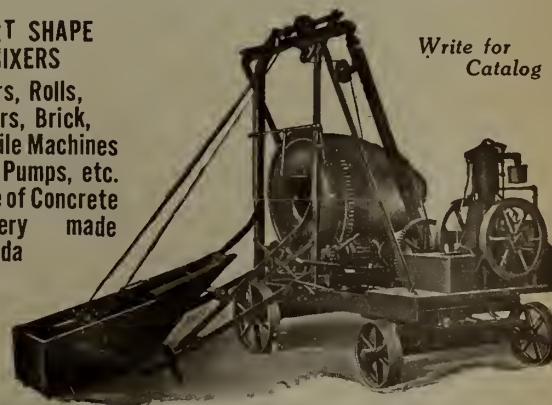
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

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## The Canadian Mining Journal

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### FOOD PRODUCTION.

Managers of mining properties have it in their power to materially assist in increasing production of food. Many mine employees like to work in gardens. Why not encourage them as much as possible this year?

Given ground to cultivate and a little assistance with the heavier work, the employees of mining companies could spend their spare hours to great advantage. Many of these men have neither the land nor the implements necessary for preparing the land. An effort should be made to provide plots and to do the plowing.

The average miner yearns to do a little gardening. He needs some encouragement at the start. Once the land is prepared and seeded the miner can take care of it in his spare hours.

Every mining camp should this year produce food as well as minerals. The gardens will give pleasure and profit to the workers and will help the world to avert famine.

Our contemporary "Mining and Scientific Press" commenting on the fact that Canadian mining companies are being supplied with cyanide at 15 cents per pound by a British firm, while Americans are paying ridiculous prices—from 30 cents to \$1.30 per pound—says: "If cyanide can be supplied from Glasgow to Ontario at 15 cents why can it not be supplied from New Jersey to Nevada and California at something like the same cost?"

Perhaps if our contemporary would enquire of some of the leading users of cyanide in the United States it would learn that the reason is obvious. The firm on which our American friends depend for their supply is a German firm, which has naturally made no great efforts to meet the demands, though it has made a great pretence of doing so.

### THE COAL SHORTAGE.

It probably is not realized that as food shortage is today on every lip, so before long will coal shortage be the common topic of conversation. The reason for coal shortage is not far to seek. The consumption of coal is unprecedented, it has no previous parallel. Coal is the basic munition of this war, and is being used up at a tremendous rate in every country where it can be got at. Accompanying this unparalleled rate of consumption is a diminished production. Nowhere is any large increase in the rate of coal production possible today. During the past three years coal has been produced in smaller quantity than the normal pre-war tonnages. Great Britain has made extraordinary efforts to maintain her coal supply, and considering the enormous enlistment of miners has done excellently

well, but the following figures will show what has taken place.

#### Output of coal in the United Kingdom

|            | Tons        |
|------------|-------------|
| 1913 ..... | 287,412,000 |
| 1914 ..... | 265,643,000 |
| 1915 ..... | 253,179,000 |
| 1916 ..... | 255,846,000 |

On the basis of 1913, it will be seen that there is a decline which over the three years of the war totals nearly 90,000,000 tons of coal. It is not only the shortage today, but the accumulated shortage of three years that is telling on the world's coal supply at the present time.

The production of the United States shows up rather more encouragingly, but nevertheless, on the basis of 1913, there is still a shortage over the period of the war. The production of coal in the United States during the past few years, with 1916 closely estimated, has been as follows:

Output of coal in the United States including both anthracite and bituminous:

|            | Tons         |
|------------|--------------|
| 1913 ..... | 570,048,125  |
| 1914 ..... | 513,525,477  |
| 1915 ..... | *530,000,000 |
| 1916 ..... | *597,000,000 |

\*Estimated

In comparison with these huge totals the Canadian coal production does not seem very important, but from our point of view it is all important. The following figures show a similar tendency during the war period to the figures given for Great Britain and the United States:

#### Production of coal in Canada

|            | Short tons |
|------------|------------|
| 1913 ..... | 15,012,178 |
| 1914 ..... | 13,637,529 |
| 1915 ..... | 13,267,023 |
| 1916 ..... | 14,461,678 |

The decrease in Canada is larger than would be assumed from the foregoing figures, because the production of 1913 itself showed a decline over 1912 of 875,000 tons.

Similar reductions have taken place in other countries, notably in France, Belgium, the Central Empires, and in Russia. Possibly Japan may be an exception to the rule, but it is an almost solitary exception.

What are the prospects for the future? It is certain that no great advance is possible in the United Kingdom until the progress of the war will permit of the release of miners from the ranks. By deciding upon the selective draft system it is to be hoped that United States may secure itself against a depletion of the ranks of the coal producers, but because of the large number of men who have already left the mines of the United States to join the armies in Europe, and the

large number of men who have been attracted to munitions work and other employment, it is doubtful whether any marked advance over the production of 1916 is possible. In Canada, some increase may be expected from the Western collieries, but in Nova Scotia there will be a large decrease over 1916 figures. On the whole it is not to be expected that the Canadian production will exceed last year's output.

It seems therefore inevitable that the shortage of coal which was experienced last winter will be repeated next winter in a much more acute form, and this irrespective of whether hostilities cease this year or not. The only palliation possible—the word palliation is used advisedly, because there is no absolute remedy in sight—is to **discontinue entirely all enlistments of miners**, and to institute such economies in the use of coal as are possible. The daylight-saving scheme which proved so successful in European countries last summer, and is being adopted this year at an earlier date, was actuated primarily by a desire to save fuel and light, and it is quite certain that large economies are possible along these lines in North America.

Much more might be said, but sufficient has been detailed to show that the coal shortage is no passing phase, but that it is world-wide and promises to become much more serious than it has yet been. Some rather ingenious suggestions have been made in upper Canadian newspapers, particularly in some of the Toronto papers, that a solution of the difficulties might be found if the Government were to take over the collieries and operate them. It is a vain hope, and the experience of government operation that Canada has so far had is not such as to recommend it to those who daily face the problems of coal production and know the facts. Even were the Canadian coal production restored to its maximum of say 16,000,000 short tons, how infinitesimal is this quantity when viewed in the light of the accumulated coal shortage of the world during the period of the war, and the inevitable shortage that is yet to come.

F. W. G.

#### THE PRICE OF FOOD.

There appears to be something radically wrong in connection with the increased cost of some staple articles. Mr. Lloyd George announces in the House of Commons that there are 87,000,000 bushels of wheat in Canada "for the fetching." The Canadian Government feel compelled to allow the entrance of wheat into the United States because of the restricted outlet caused by submarine operations and the shortage of ships, and concurrently with this apparent surplus of wheat in Canada, the price of flour jumps in one week from \$12.50 to over \$15.00 per barrel, and it is confidently predicted flour will shortly reach \$20.00 per barrel! The Dominion Coal Company had the courage and foresight to use its purchasing capacity last summer to purchase flour in large quantities, and it is and has been selling flour to its workpeople at from \$3.00 to \$5.00 per barrel below the wholesale price. This



Company is selling potatoes to its workpeople at 85 cents per bushel, while the local farmers are asking \$2.00 a bushel. What is there that makes the same bushel of potatoes worth 75 cents last autumn and \$2.00 today, when the cost of transportation and all other costs play no part in the increase?

If a private corporation can by the exercise of ordinary prudence and foresight control the cost of living in this way where is the Canadian Government? Food shortage there may be, and undoubtedly is, but what is there to justify a raise of \$3.00 a barrel for flour in one week, when admittedly Canada cannot consume or send to Europe her existing stocks of flour?

### THAT MEMORANDUM OF THE CIVIL ENGINEERS

In our last issue we called attention to the propaganda of the Canadian Society of Civil Engineers, in which the mining societies of Canada are misrepresented. Canada has two mining societies composed largely of technical men; The Canadian Mining Institute and the Mining Society of Nova Scotia. Naturally very few mining men belong to the Society of Civil Engineers. Yet the latter society in advancing its own claims as a society representing the technical men of Canada, has published and distributed a pamphlet which contains such absurd statements as the following:

"There is in Canada one engineering Organization, namely the Canadian Society of Civil Engineers, which embraces all branches of engineering and may be taken to correspond largely to the five great scientific bodies from which the Government of the United States selected the great part of its Naval Consulting Board. There are in addition two other organizations of less magnitude and which include in their membership a number who are also members of the Canadian Society of Civil Engineers. These two are the Canadian Mining Institute and The Society of Chemical Industry. The Royal Society of Canada may also be considered a scientific society, but the great majority of its members are devoted to philosophy and literature. The accompanying chart indicates the number of fully qualified technical men in each of the organizations named:" The chart misrepresenting the Canadian Mining Institute credits that organization with a total membership of 1017 of whom 817 are "Lay Members" and 200 "Fully qualified Technical men mostly Members of Canadian Society of Civil Engineers."

The statements made in the memorandum are pure fabrications. The number of qualified technical men in the Canadian Mining Institute is over 800 and less than 5 per cent of these belong to the Society of Civil Engineers.

The Civil Engineers completely ignore the existence of the Mining Society of Nova Scotia. It is perhaps as well. Anything which the Civil Engineers said about it would probably have been bunk.

In spite of the misleading information contained in the memorandum the Society of Civil Engineers seems to be proud of it. They are sending out with copies of the memorandum letters asking that members publish the nonsense as widely as possible.

### PREMIER'S SUMMARY REVIEW OF MINING IN B. C.

In the course of his budget speech, delivered in the Legislative Assembly of British Columbia on April 23, Premier Brewster, who is also for the time acting as Minister of Finance for the Province, gave figures among which were the following, showing the estimated value of production in 1916, and, for the purposes of comparison, the corresponding figures for the year 1915:

| Products.             | 1916.<br>(estimated). | 1915.        |
|-----------------------|-----------------------|--------------|
| Mines . . . . .       | \$42,300,000          | \$29,448,000 |
| Forests . . . . .     | 35,528,000            | 29,150,000   |
| Agriculture . . . . . | 32,259,157            | 31,127,801   |
| Fisheries . . . . .   | 14,538,320            | 11,515,086   |

A published report of the Premier's observations relative to mining is as follows:

The total value of the mineral production of the Province for all years to the end of 1916 was roughly \$558,500,000. The value of the output for 1916 was nearly \$42,300,000 an increase of 44 per cent. over that of the preceding year. The output from metalliferous mining in 1915 was valued at nearly \$21,000,000, while in 1916 it was more than \$32,000,000, an increase over the first mentioned year of about \$11,000,000, or 54 per cent., while, as compared with the previous record, which was for the year 1912, the increase was 76 per cent.

While some of this enormous increase in value is undoubtedly due to the higher market value of most of the metals, yet in each of the metals, except gold, there has been a largely increased quantity produced of the more important economic metals, lead, the output of which in 1915 was 46,500,000 lb., was in 1916 nearly 49,000,000 lb., an increase of 2,500,000 lb. of metal produced. Similarly the output of copper increased, from 57,000,000 to nearly 65,500,000 lb., an increase of about 8,500,000 lb., and the quantity of zinc produced increased from about 13,000,000 in 1915 to 37,000,000 lb. in 1916, an increase of 24,000,000 lb., or nearly 200 per cent.

These facts, represented by figures, indicate that the industry as a whole has been enjoying a most profitable and successful year, while there is every reason to expect that such will continue during 1917, the first three months of which year have already expired, and have given such definite indications that it is safe to predict that the mineral output for 1917 will be greater by \$50,000,000.

The tonnage of ore mined in the Province in 1915 was about 2,700,000 tons, while in 1916 it was about 3,200,000 tons. There was no doubt but that this great increase in output was stimulated by the high prices of metals due to war conditions, but it is now practically assured that these high prices will continue for the full year 1917.

Coal mining is largely dependent on other mining for a market, and the increase in metal mining has had its influence on the coal and coke output, which in 1916 was nearly \$2,000,000 higher than the preceding year, while it seems probable that a similar increase will be made in 1917, bringing the gross value of the products of the collieries up to more than \$11,000,000.



## CORRESPONDENCE

### Those Phosphate Deposits at Banff.

Editor, Canadian Mining Journal, Toronto:

Sir,—Owing to absence from the office, the editorial note appended to my letter in your issue of March 15th, has only come under my notice recently.

In my letter I accused you of making three absolutely untrue statements. By your failure to contradict or disprove my statements, you virtually admit their accuracy.

In your editorial note, instead of acknowledging frankly and manfully that you had been misinformed you aggravate your original offense by vulgar abuse and statements that are devoid of any basis of facts.

(1) You accuse me of making "mis-statements." This statement is an absolute falsehood and that it is not inadvertent is demonstrated by your failure to take issue with even one of the clear cut statements that I made.

(2) You say that the Commission has no "sufficient reason for its existence." This statement, like your original reference to the work of the Commission, is drawn from the unrivalled stock of misinformation which you undoubtedly possess.

(3) You say that we published "reports of the possibilities of imaginary resources, reports that are on a par with a wild-cat prospectus." This statement is absolutely without foundation in either substance or in detail, it is absolutely false and demonstrates that, finding yourself without any case, you resorted to abuse to cover up your discomfiture.

(4) I accuse you of making a statement that is absolutely untrue when you say we were "warned long before" our reports were published. We were not "warned" and it was impossible for any one to "warn" us inasmuch as the area that has been examined is to the unexamined area, less, in proportion, that one word in your issue of March 15th bears to the whole issue.

(5) As an additional specimen of your reckless statements I will cite your statement that we published "voluminous" reports respecting the phosphate discovery. Respecting phosphate we have published, in all some 39 octavo pages which included 4 pages of index. Respecting the work in the Rockies we have published 7 pages! I suggest that you purchase a primer on "Meanings of English Words in Common Use" and thus acquire some slight knowledge of the meaning of the word "voluminous."

(6) At the Ottawa meeting of the Canadian Mining Institute, Dr. Adams read a paper on this Phosphate Discovery and Dr. W. F. Ferrier contributed to the discussion an account of his examinations of the phosphate-bearing beds at various points in the Rockies.

Prof. H. E. Haultain, summing up these addresses, said: "I make the most profound obeisance to these two geologists: Dr. Adams' work represents the most magnificent piece of prospecting of which one has knowledge, and I have no doubt the work of Dr. Ferrier was no less admirable."

In your issue of April 15, the professorial correspondent who hides behind "Observant Reader," informed you that "you have not shown to advantage in this matter."

Yours etc.

Ottawa, April 26, 1917.

JAMES WHITE.

The above characteristic letter from Mr. White speaks for itself to those who are familiar with the facts. It is the kind of letter they would expect him to write.

For the benefit of those who are not familiar with the story of the discovery of phosphate beds in the Rockies we reprint elsewhere in this issue the statement made by Mr. W. F. Ferrier at a meeting of the Canadian Mining Institute held in Ottawa in March, 1916. From this statement it will be evident that the phosphate beds had been very carefully examined by men familiar with the phosphate mining industry before the Commission of Conservation began its search. Mr. Ferrier had fully explored the region and thoroughly tested the phosphate beds and found none of the deposits to be of any commercial value; but had failed to make public the results of his work.

The Commission, apparently in ignorance of the work which had been done, undertook the task of prospecting for phosphate and succeeded in finding a phosphate boulder near the geological horizon at which phosphate beds are known to occur in the western States. They gave out a statement to the daily press reporting their discovery.

Mr. Ferrier, a former officer of the Geological Survey, noting the press report, went to Ottawa and advised one of the Commission's officers that he had carefully prospected the area in question and had discovered not only boulders but beds of phosphate there. He was able to advise this officer that the deposits had been carefully traced, sampled, analyzed and tested by concentration devices and found to be of no value. The beds are too thin and too low grade to be of commercial importance. Mr. Ferrier did not give this information out for publication; but doubtless hoped that the facts he presented would prevent rash statements being made by the Commission regarding the possibility of locating economic deposits of phosphate.

Evidently, however, the Commission thought that the public would not think much of a report on the discovery of phosphate unless it were painted in glowing phrases, and the report issued contained no suggestion of the unpleasant facts.

In view of the facts, Mr. White's denial of the warning given is an indication that he did not believe that the facts were known.

Mr. White complains of our use of the word "voluminous." He says that the 39 page report, which is entitled "Discovery of Phosphate of Lime in the Rocky Mountains" contains only 7 pages respecting the work in the Rockies. There are only 7 pages. In this we agree with Mr. White. Seven pages is quite enough.

Mr. White objects to our comparison of the report with a wild-cat prospectus. Comparing it with such literature one will find many points of similarity. No deposits of importance having been found by the authors of the report, extracts from descriptions of several deposits in the Western States are given. There being no workable deposits in Canada known to the authors, photographs of those in Montana are reproduced and colored geological maps are copied from various old reports. The whole report is calculated to delude Canadians into the belief that the discovery made by the Commission is of economic importance. That the Commission has been successful in fooling the public by this report is evidenced by the statements made by many men during the past winter.



**Potash from Feldspar.**

Editor, The Canadian Mining Journal:

Sir,—According to "Scientific American," April 7th, 1917, p. 351, quoting a Toronto newspaper, "a company making Portland cement at Durham Ont., is now turning as a by-product from feldspar 12 to 16 tons of potash daily. The cost of manufacturing potash in Canada is so low even now that it is less than the freight charge paid on a ton of the imported German product before the war."

According to "Canadian Mining Journal," March 1st, 1917, p. 114, quoting Dr. H. S. de Schmidt, "it still remains questionable, whether any of the methods proposed can successfully be employed on a commercial scale at a time of normal prices for potash salts."

According to "Revue Generale des Sciences Pures et Appliquees," 15 Mars, 1917, p. 132, "Le feldspath orthose chauffe dans un haut fourneau avec de la pierre a chaux donne un produit contenant de la potasse dont la majorite est sous forme de silicate; nous ne savons que tres peu de chose au sujet de l'utilite des silicates pour la nutrition. . . ."

If some of the writers of the Canadian Mining Journal could throw a ray of light on the question, I would be most grateful.

Yours etc,

P. FONTANEL.

Montreal, April 27, 1917.

**GRANBY CO'S COPPER PRODUCTION.**

Production of copper by the Granby Consolidated Mining, Smelting and Power Company, Ltd., in March amounted to 3,901,398 lb., compared with 2,580,288 lb. in February, 2,946,476 lb. in January, 3,219,022 lb. in December, 4,151,001 lb. in November, a high record of 4,727,929 lb. in May last, and 3,555,441 lb. in March, 1916.

Of the total for April of this year, 2,814,780 lb. was produced at Anyox, against 1,968,426 lb. in February, 2,319,502 lb. in January, 2,395,810 lb. in December, 3,017,259 lb. in November, 3,383,230 lb. in May, and 2,300,227 lb. in March last year, while at Grand Forks 1,086,618 lb. was produced in April, contrasted with 611,862 lb. in February, 626,974 lb. in January, 823,212 lb. in December, 1,133,742 lb. in November, 1,344,699 lb. in May, and 1,255,184 lb. in March, 1916.

In the course of a speech he made in the Legislative Assembly of British Columbia during the Provincial Budget debate, Mr. John Keen, member for the constituency of Kaslo, West Kootenay, touched on the question of taxation of the mining industry. He said that he hoped whatever levies Premier Brewster made in that direction, he would not kill the goose that was laying the golden eggs. "What we need is a vast and everlasting faith in our country," he said. "If we take care of our mining industry and give it the encouragement which it should receive, the few million dollars of debt this Province may have will soon be paid off."

**PHOSPHATE DEPOSITS OF WESTERN UNITED STATES AND CANADA.\***

By W. F. Ferrier.

From 1904 to 1908 I was engaged in exploration and development of the phosphate deposits in the Western States to which Dr. Adams has made reference. It was not until 1906 that the United States Geological Survey had parties in the field to investigate these deposits. I was in charge of the work for my principals for four years, and traced the deposits over the States of Utah, Idaho, Wyoming, and Nevada almost to the borders of California.

When in Washington I urged the U. S. Geological Survey to put parties in the field; and eventually Mr. F. B. Weeks was assigned to the work. I had been asked by the Director to write a Bulletin for the U. S. Geological Survey, but as I represented private interests I declined the invitation to undertake the sole authorship of such a report, offering instead to place all the material and facts we had accumulated at the disposal of Mr. Weeks, to give him access to all our plans, sections, and collections of fossils, and to guide him over the ground. The offer was accepted, and in 1906 a report was published by the U. S. Geological Survey, entitled: "Phosphate Deposits in the Western States, by F. B. Weeks and W. F. Ferrier."

The first phosphate was mined and shipped from the Waterloo claim, at Montpelier, Idaho. We were fortunate in the location of that property because the main phosphate bed, which is about five feet thick and very uniform, was covered, over a large area, by a bed of limestone only, about 18 inches thick, very hard, and full of fossils. This bed had protected the underlying phosphate from erosion and by merely stripping it away we were able to obtain many thousand tons of phosphate before we were forced to go underground. The phosphate was so soft at first that we used coal augers and light charges of black powder.

At this time I urged my principals to investigate the occurrences which I felt confident, from a study of the maps and reports of the Canadian Geological Survey, would be found to extend into Canada. My chief reason for doing so was that there were certain difficulties regarding railroad rates for the shipment of phosphate in and from the United States, and it was impossible to get a combined rail and steamship rate. At that time the best field for the phosphate industry lay in the export trade, the amount required for the Western States being very trifling and the rates for shipment to the eastern market prohibitive. We sent shipments to Australia and had enquiries from Germany, Japan, and Honolulu, so that if we had found phosphate in Canada we would not only have had a shorter railroad haul, with the possibility of getting acid at the coast, but also much better facilities for shipments abroad. I had also indicated that some phosphate might be found in Nova Scotia, although aware that the carboniferous rocks there belonged to a lower horizon. I was sent to investigate some copper properties in Nova Scotia; so that my first search for phosphate was made there instead of in British Columbia and Alberta. I intended to go to Alberta the next season, but circumstances prevented and nothing further was done.

When I returned to Canada my thoughts were still on the possibilities of finding the phosphate, but I found it exceedingly difficult to interest anyone in the subject. Finally I succeeded, and the credit belongs chiefly to Sir Edmund Walker, who has always taken a keen interest in geology and is, as is known, a warm friend of

\*Statement made at the March 1916 Meeting of the Canadian Mining Institute.



our Geological Survey. He appreciated the situation and it was through him with others that I was enabled to do my first work. Afterwards Mr. C. C. Ray of Ottawa became interested and enabled me to continue the search for commercial deposits.

The first field work I did was in 1912, and the first discovery of phosphate was made on June 11th of that year, at practically the same place where Dr. Adams found it. The float occurred on the old timber slide going up to the divide by Stony Squaw mountain at Banff. I traced it over the divide to Forty-Mile creek. **All over the Banff area I found small beds or layers of phosphate rock, but nothing of sufficient size to be commercially valuable under present conditions.** I tried to obtain permission to publish my results, and when Dr. Adams' find was announced in the papers, made a trip to Ottawa. I was not even permitted to say that I had found phosphate. In fact it was only the day before I left for Ottawa to attend this meeting that I finally received permission by telegraph to make the matter public. Dr. Adams is quite correct in saying that nothing was published on the subject, but I have done detailed work during four seasons and covered ground not only in the Banff area but also in the Yellowhead Pass, the Crowsnest Pass, and south to the International boundary.

I may say that I think the Geological Survey deserves great credit for the excellent maps and sections prepared, some of them as early as 1886, of the districts in which I worked. It was whilst studying those maps and the reports that I became convinced phosphate was to be found in Canada and I found that I could roughly correlate the geological divisions with those of the Western States before I had seen them in the field. Mr. James McEvoy was with me during part of my later work. In 1905, when in the Western States, I had knowledge, through one of my assistants, of the occurrence of phosphate in Montana, but the grade was so much lower than what we had elsewhere—our phosphate beds ran from 70 to 80 per cent tribasic calcium phosphate—and the conditions for development at our principal mine were so nearly ideal that I did not consider it worth while to investigate at the time. With regard to my work in Canada I hope to obtain further permission to publish a paper, because I think all such matters ought to be made public, and I am, personally, quite willing to give all the information I can. During my detailed examinations of the geological sections throughout the country from the Yellowhead Pass to the International boundary many interesting facts were noted, but time will not permit me to discuss them here. The thickness of some of the divisions of the Carboniferous as given in the Geological Survey reports, is, I think, overestimated, and I am convinced that much of the Upper Banff Shale is really Jurassic, possibly in part Triassic. Ammonites were found abundantly in areas mapped as Upper Banff Shale.

There are one or two things I would like to mention in connection with Dr. Adams' published report. With regard to the horizon of the phosphate beds he indicates that somewhere near the contact of the Upper Banff limestone and the Rocky Mountain quartzite is the place to look for them; but in fact what has been found lies high up in the Rocky Mountain quartzite, near the top, and not at the base. **In the Banff area I have found only small beds or layers, not over 12 inches or so in thickness, running up to 22 per cent. or 23 per cent. phosphoric acid, and similar beds with somewhat higher percentages elsewhere.** Some shaly beds overlying the Rocky Mountain quartzite are also strongly phosphatic.

An interesting occurrence of phosphatic nodules and fragments is to be seen in the highly tilted beds which

form the east bank of the Bow river, for a long distance, at Banff. The line of strike of this phosphate horizon extends from the Bow river over to Forty-mile creek, as may be seen by the geological map of this region.

I would suggest that in pointing out to the prospector what to do to identify phosphate rock, a more simple way than the one described is to carry a few crystals of ammonium molybdate and a small bottle of nitric acid. a minute fragment of the ammonium molybdate placed on the rock and moistened with acid will give, in the case of phosphate rock, a bright yellow coloration, varying in intensity according to the percentage of phosphoric acid contained in the rock.

In conclusion, beds of phosphate, though very small, were found in all the sections examined, and I am sorry to say that up to this day nothing has been found to compare with the deposits of the Western States, and nothing that I could conscientiously recommend for the expenditure of capital.

### COPPER IN NORTHERN INTERIOR OF B.C.

In his "Notes on the Copper Deposits of the Northern Interior of British Columbia, read at the meeting of the Western Branch of the Canadian Mining Institute, in Vancouver, Mr. John D. Galloway, assistant mineralogist for the Province, made the introductory comment that "Copper mining is now the most important form of mining in British Columbia, and although the last two years has witnessed a steadily increased production of copper, there is little doubt but that the output will continue to be still further augmented in the near future. The Northern Interior portion of the Province has as yet contributed only a small proportion of the yearly copper production of British Columbia, but it must be remembered that it is only within the last three years that railway transportation, by means of the Grand Trunk Pacific railway, has been provided in that region, and this railway serves only a limited area of country on either side of the track."

Prospecting has been in progress along the line of the Grand Trunk Pacific railway for some years, but it is only recently that development may be said to have been commenced. At present the only important copper-producing section of the Northern Interior is the Hazelton-Telkwa district of Omineca mining division, from which the Rocher Deboile mine contributes the greater part of the production.

Along lower Skeena river, in the Babine country, and east of Telkwa along the G. T. P. railway many copper prospects are being developed but production from them so far has been very small. Between the G. T. P. railway and Lillooet district there is a strip of virtually unprospected country in which copper and other minerals may be found; this is along the eastern contact zone of the Pacific Coast range. This range is 1,000 miles long, from the International Boundary line northward through British Columbia into Alaska. It is known to contain commercially valuable orebodies in many places along both its eastern and western contacts. The Britannia mine is an especially good example of a very large low-grade copper-bearing orebody; the Granby Co.'s Hidden Creek mine is another. It should be remembered that often a long time is taken to turn a copper prospect into a largely productive mine, with large expenditures for development work and for equipment for cheap and efficient working.

In the Hazelton-Telkwa district the mineralization embraces ores of gold, silver, lead, and zinc, as well as



copper, the last mentioned being as a rule small to medium-sized deposits as distinguished from large low-grade orebodies in other parts of the province. In the mountains on both sides of Skeena river, below Pacific station, many showings of copper ore have been discovered, but as a rule they are irregular and non-continuous. Further development, however, may disclose the occurrence of large low-grade orebodies. Small quantities of high-grade copper-silver ore are found on Hudson Bay mountain, Howson and Hunter basins, but ore production from them as yet is of only slight importance.

The production of copper from the Hazelton-Telkwa district in 1915 was 2,831,279 lb., of which quantity 2,788,000 lb. was from the Rocher Debole mine; in 1916 the same mine contributed nearly all of the district total of 1,646,072 lb. This leading copper mine of the district was described at some length by Mr. Galloway, who after mentioning a number of other properties in the same neighborhood, referred to the Cassiar Crown, 18 miles east of Telkwa, and the Santa Maria, now shipping high-grade copper ore, situated in Howson basin.

In conclusion, there seems to be sufficient evidence on which to base a reasonable hope that the Northern Interior of British Columbia will in future years contribute materially to the copper production of the Province. In regard to the Hazelton-Telkwa district proper, many of the orebodies here should prove attractive to small mining syndicates and individual operators, as large amounts of capital are not required to develop and equip these deposits of medium to high-grade ores. Capital is already coming in from Edmonton, Alberta, and Spokane, Washington, and the district appears to offer good opportunities for capital from Vancouver and Victoria.

### METAL MELTING.

A special feature of the Spring meeting of the Institute of Metals, held on March 21st and 22nd was a general discussion on metal melting, a subject which hitherto has received very little attention from the scientific societies.

It has assumed great national importance, since vast quantities of fuel—solid, liquid and gaseous—are used in metal melting, particularly for munitions making. Economies in the use of these fuels in the metal industries are generally realized to be possible, but the lack of comparative data has often hindered the adoption of the most efficient means of metal melting.

The Institute of Metals is very fortunate in having as its president, who will preside over the discussion, Sir George Beilby, LL.D., F.R.S., the head of the new Government Board of Fuel Research.

At the meeting a series of six communications were made bearing on all phases of the question of the melting of the non-ferrous metals, whether by high pressure or low pressure, gas, coke, oil fuel, or electricity.

### GREAT SULPHIDE.

There is considerable activity in The Pas district, Western Manitoba, this spring and good results are being obtained. The Great Sulphide property at Flin Flon is being further tested by diamond drilling, and a large additional quantity of ore is already indicated. Mr. W. W. Mein is directing the work. Mr. Scarpe is at the property in charge of exploration work.

## PERSONAL

Mr. Thomas Graham, who recently resigned the position of Chief Inspector of Mines for British Columbia, late in April returned to Victoria from the Coal Creek colliery of the Crow's Nest Pass Coal Co., where he had been in company with his successor, Mr. George Wilkinson, to investigate the cause of an explosion that took place last month in one of the coal mines there. He has since assumed his new duties as general superintendent for the Canadian Collieries (Dunsmuir), Limited, with collieries at Extension and Cumberland, on Vancouver island.

Mr. Alex. Smith, of Toronto, who was for years manager of the Surprise silver-lead-zinc mine in the Slocan district of British Columbia, was a recent visitor to the Coast cities of Victoria and Vancouver.

Mr. Andrew G. Larson, who has for years been actively associated with mining in Kootenay district of British Columbia, was in the East lately on a business visit in connection with a proposed amalgamation of gold mining properties situated in Sheep Creek camp, Nelson mining division of that province.

Mr. W. B. Bishop, superintendent of the Granby Consolidated Co.'s big smelting works at Grand Forks, Boundary district of British Columbia, was recently on a business visit to Vancouver, where are the company's headquarters in the Province.

Mr. C. M. Campbell, mine superintendent for the Granby Consolidated Co., at its copper mines in Phoenix camp, Boundary district, B.C., is in southern California, seeking to recuperate after a serious illness.

Mr. R. H. Stewart, formerly general manager for the Consolidated Mining and Smelting Company of Canada, Ltd., was entertained at a valedictory banquet at Rossland, B.C., last month, on the eve of his leaving the Kootenay district for Vancouver, where he intends opening an office as a consulting mining engineer. At the banquet, which was attended by about 250 residents of Rossland and other parts of Kootenay, a presentation of a costly and beautiful silver service and salver was made to Mr. and Mrs. Stewart.

Mr. M. E. Purcell, superintendent of the Consolidated Mining and Smelting Co.'s Centre Star-War Eagle group of mines in Rossland camp, British Columbia, has been spending two or three weeks visiting mining properties in Skeena and Omineca mining divisions, going to them from Prince Rupert.

Mr. E. A. Cleveland, of Vancouver, B.C., is consulting engineer for the company operating the gold property near Surf inlet, Princess Royal island.

Mons. H. Maluin, general manager of the Mines d'Otter, operating a hydraulic placer-gold mine on Otter creek, in Atlin camp, has returned to British Columbia from Paris. He will remain in that province several months and then go back to France.

Mr. W. M. Brewster, M.E., of Victoria, B.C., has prepared for the British Columbia Bureau of Mines a report on the "Iron-ore Deposits of Vancouver and Texada Islands, B.C.," which report has been printed and issued by the B. C. Department of Mines.

Mr. W. J. Barker, of Nelson, B.C., has been appointed superintendent of the Emerald lead mine, situated eight miles from Salmo, in the southern part of Nelson mining division.



Mr. C. W. Nicols, of Detroit, Michigan, has been appointed assayer for the Highland Valley Mining and Development Co., which is engaged in mining and concentrating copper ore in Ashcroft mining division of British Columbia. He arrived at the mine last month.

Mr. J. E. Hammell and Mr. J. W. Callinan are in Toronto. Mr. Callinan will return to The Pas shortly.

Mr. Thomas Morrison of Pittsburg and Charles Hayden of Hayden, Stone & Co., were elected directors to fill unexpired terms of Col. R. M. Thompson and S. H. Pell, resigned. W. T. Graham was elected to executive committee to fill unexpired term of Col. Thompson.

Mr. S. S. Fowler, of Riondel, Kootenay lake, B.C., general manager for the New Canadian Metal Co., owning the Bluebell lead mine, has returned to British Columbia for a holiday vacation spent in southern California.

Mr. Frank B. Smith, of Edmonton, Alberta, has been examining placer-mining property on Government creek, in the Fort George region, northern Cariboo district of British Columbia.

Mr. Geo. W. Clinton has resigned as superintendent of the Comox colliery of the Canadian Collieries (Dunsmuir), Ltd., Vancouver Island, British Columbia, after having been employed there, first with the Dunsmuir interests and latterly, since the mines were acquired by the Canadian Collieries, with that company, over a period of thirty years.

Mr. M. S. Davys, of Kaslo, B.C., was in Victoria at the end of April, on his way back to Kootenay district, after having been in southern California for several weeks. During the winter he suffered from a serious illness with pneumonia, and as soon as he was fit to travel he went South to obtain the benefit of a warmer climate. He is now convalescent and expects to soon be once again busy in connection with mining in the Kootenay.

Mr. C. H. Hitchcock has become a member of the Smith & Travers Diamond Drill Co., Ltd., Sudbury, Ont. Mr. Hitchcock has moved his office from Copper Cliff to Sudbury, and will continue his examination work and search for new properties.

Mr. Anton Gronningsaeter, general manager Kristiansands Nickel Refining Works, Kristiansand, Norway, was in Toronto last week and is now visiting Western mining districts.

### SIMILKAMEEN.

Progress is being continued at the big group of copper claims, on which the British Columbia Copper Co., of late years the operating company of the Canada Copper Corporation, of New York City, did much work. Concerning some new equipment, the Similkameen Star, of Princeton, Similkameen, recently printed this information: "For the past week the big pump installed on the Similkameen river by the Canada Copper Corporation to raise water to Copper mountain, has been working successfully. The pump is driven by a large motor and the water is lifted 1700 ft. through a pipe-line 6000 ft. in length. The water is raised at the rate of 5,000 gallons an hour to two 20,000-gallon tanks. On the hill the water has 150 lb. pressure, and at the foot of the hill 750 lb. pressure per square inch. The water is used to supply the 50-

ton experimental mill just being put in operation, in the mine, and for domestic purposes. The pump is of the Gould triplex type, and the pipe-line is composed of 4-inch high-pressure hydraulic pipe.

Mr. Oscar Lachmund, general manager of the Canada Copper Corporation, when in Spokane, on his return journey from New York to British Columbia, after having attended the company's annual meeting, was reported by the Spokesman-Review to have said: "New York and Boston mining engineers confirm our reports as to the estimated quantity and grade of the ore we have developed on Copper mountain, our estimates having been 10,000,000 tons of assured ore and 5,000,000 tons of probable ore, with an excellent possibility of increased tonnage. The ore contains 1.75 per cent copper and twenty cents a ton in recoverable gold and silver. Plans are being formulated to equip the mines for a production of 2,000 tons of ore a day; also for the installation of a power plant and mill, capable of handling that quantity. The plans include houses for men, of whom 600 will ultimately be employed in mines and mill. We hope to shortly begin the installation of the equipment. Results have been up to expectation in the operation of our 50-ton experimental mill, which is running continuously. We hope to make an extraction of 90 per cent from the ores we shall put through the mill.

### CROW'S NEST PASS COAL CO.

The annual meeting of shareholders in the Crow's Nest Pass Coal Co. was held in Toronto, on April 13. The report of the directors and the statement of accounts presented showed that the net profits for the year 1916 had been \$340,501, as compared with profits from all sources of \$429,554 for 1915.

The balance at credit of Profit and Loss account when the year opened was \$431,499; adding the profit for 1916, a total of \$772,000 resulted. Deducting the four quarterly dividends paid each of one and one-half per cent and totalling \$372,666, there remained \$399,334. The profits of subsidiary companies for the years 1913, 1914 and 1915, which had been taken up as income, have been written off, and the amount, \$76,854, applied to depreciation account of these companies. This further deduction from the Profit and Loss account balance left at credit of the account a net amount of \$322,480, to be carried forward to the year 1917.

Expenditure during 1916 on improvements and developments, in connection with both the coal company and its subsidiaries, was \$64,549.

The year's gross output of coal from all mines worked, both at Coal Creek and Michel collieries, was 910,889 short tons. Part of this was made into coke, of which a total of 268,989 short tons was made, this quantity being 282 tons less than the output of 1915.

The balance sheet shows liquid assets of cash \$177,312, accounts receivable \$227,071, and value of coal, coke, and stores on hand \$217,424, a total of \$621,807 practically cash assets. Against this amount there are liabilities consisting of accounts payable \$239,084, and unpaid dividends \$42,513.

In addition to the assets mentioned above, there is shown in the balance sheet an amount of \$970,349, value of securities owned by the company, much of which is understood to consist of high-class bonds.



## THE IMPORTANCE OF COAL IN WAR.

By D. H. McDougall.

Presidential Address, (Annual Meeting Mining Society of Nova Scotia, April 19th, 1917.)

We have not met in regular annual meeting since April, 1914, which we remember not only as the first meeting at the Sydney headquarters, but as a very successful and inspiring gathering. We little dreamed of what the future held in store.

We are now approaching the close of the third year of the war. In the meantime we have considered, and I believe rightly, that the energies of our members were being expended most usefully and effectively in the daily routine of mining and in the manufacture of munitions of war.

This year we have considered it necessary to hold an annual meeting so that we might not lose sight of our Society's importance, and also that we might prepare for the happy gathering we hope to have when our allies shall be victorious and our enemies definitely and thoroughly defeated.

It has been thought advisable by the Executive to confine our proceedings to one day, and to dispense with the social functions that accompany the annual dinner. This is not any evidence of a loss of interest by our members nor inability to obtain from them a sufficient number of interesting technical papers, but is because of our realization of the importance of their daily work and a natural disinclination towards social functions under existing conditions.

As you will have noticed from the Treasurer's Financial Report, the policy of the Society since the headquarters were moved to Sydney has resulted in our having a snug little sum in the savings bank instead of a debit balance, and this notwithstanding that last year we were able to donate the sum of one hundred dollars to the Red Cross Society. We hope to donate a similar amount to some patriotic object at this meeting.

As I have said, the energies of the members have been for almost three years daily expended in the production of coal, iron, limestone, gold and antimony or in the working up of these raw materials into the finished munitions of war. We have realized as never before our own importance, and the world has realized it also. We have had some facts driven home upon us that we had not previously thought much about or had taken for granted. The fundamental principles of our daily business have been forcibly brought to our attention, and we have been learning new things every day since August, 1914.

As one whom you have honored with the office of President of the Mining Society of Nova Scotia, and speaking in the metropolis of the steel and coal industries of Cape Breton, I believe I need no excuse to enlarge a little on the part played in this war by coal.

To put within the compass of one sentence the importance of coal, I venture to state that **no single department of the machinery of modern warfare can move or act without coal.** This may seem a comprehensive statement, but a little consideration will reveal its accuracy.

Nova Scotia coal at the present time, and throughout the whole course of the war, has been used for war purposes, some of which may be briefly enumerated:

The St. Lawrence patrol and the large auxiliary cruisers in North Atlantic waters have used Nova

Scotia coal, and, in addition, there has been a never-ending stream of trans-Atlantic transports sailing from the various ports of Eastern Canada. The railways from Montreal east, conveying troops and materials for shipment to Europe, have used our coal as their motive power. At the various steel and munitions works in Nova Scotia our coal seams have provided the power for the manufacture of shells of every calibre, wire for entanglements, nails and other steel products used in war, or, it would be more proper to say, used in **this** war. Large quantities of toluol, the base of the most widely used explosive in the war, have been distilled in Nova Scotia. Sulphate of ammonia, a most necessary and valuable article in agriculture, is another of our coal products that has assumed increased importance in these days of food shortage.

It is hardly an exaggeration to say that, with the exception of the domestic use of coal in the Maritime Provinces and Newfoundland, almost the whole of the coal produced in Nova Scotia is being used directly or indirectly for the prosecution of the war.

It has needed this war to demonstrate the value of coal in another way, i. e., as the equivalent of gold as a medium of commercial exchange and as a stabilizer of currency. The financial strength of Great Britain, which is the wonder and admiration of the world, has been much assisted by her ability to export coal, in addition to keeping her own fires burning. It has been a most helpful fact in maintaining British credit and the purchasing value of the pound sterling.

If we follow the course of the war, we shall see that the action of the German and Austrian armies, and later, the action of their Turkish and Bulgarian allies, was directed by a desire on the part of our enemies to obtain control of the coal and iron fields of Europe, and of that other important source of motive power, petroleum. This is a fact so patent and obvious that it is unnecessary for me to do more than mention it. The successful strategy of our own armies is at the present time quite evidently actuated by a determination to recover the coal fields of Northern France.

In the light of these events it is therefore a most serious matter to know that the output of coal from the Nova Scotia collieries during 1917 will be one of the lowest recorded during the past ten years, and will be some two million tons below the capacity of the mines for output. The reason for this decline is a matter of common knowledge. It is due to the **disproportionate enlistment of miners.** In no other coal mining centre in the British Empire have the authorities allowed enlistments to so seriously reduce the production of coal. The damage to the industry is done, and is irreparable for the further duration of the war. No advantage is now to be gained by laboring the point. There is just one thing that can be done, namely, to prohibit further enlistments from among the mine workers of Nova Scotia.

The question of immigration after the war is one that has been given a good deal of attention in the newspapers recently, and there is an impression abroad that the close of the war may see a great influx of emigrants into Canada. Of this I have great doubts, and indeed there are some good grounds for believing that after the war the movement of population will be towards Europe rather than to North America. It may be that the period immediately following the war will see a greater percentage of British-born emigrate into Canada, but there is reason to believe that there will be



not only a cessation of emigration from those countries of South-Eastern Europe which have in the past been the chief source of labor for North America, but a repatriation on a large scale of natives of these countries whose movements have been restricted during the period of the war.

It is a significant fact that the Industrial revival of Canada since the spring of 1915, and the prosperity in manufacturing activities that has since been noticeable, has been experienced in just that portion of Canada which is within the radius of the supply of the bituminous coal of Nova Scotia. The Canadian West has experienced, and is even yet under the influence of, a trade depression.

Unfortunately, the increased demand for coal brought about by the manufacturing activity in Eastern Canada has existed side by side with a coal shortage and a scarcity of steamers caused by Admiralty requisitions, with the result that shipments of coal from Nova Scotia to the Montreal market have fallen from a normal figure of two million tons per annum to a quantity that in 1917 will not exceed two hundred thousand tons.

As a result, Nova Scotia has lost the market which is the natural outlet for the coal mined here in excess of the requirements of the Province. The Montreal trade has been developed by the expenditure of large sums of money and by years of patient work, which, in the face of the strenuous American competition, has allowed only very moderate financial returns. Large sums of money have been expended on the improvement of coal preparation, in the provision of transportation and discharging facilities, and in educating the consumers of Montreal to the excellent qualities of Nova Scotia coal. When conditions again become normal, the recovery of the Montreal market will present no light problem. Apart from the difficulty of displacing our American competitors, we shall be faced by increased costs in every department of coal mining. Wages and materials will, in all probability, assume normal dimensions more slowly than they have increased.

The difficulty of transportation, owing to the loss of tonnage during the war, will persist for a long time into the future. The difficulty of procuring an adequate supply of labor I have already hinted at, and I believe that coal mining will be one of the last industries to recover a sufficient labor supply. The physical difficulties of coal mining in the meantime will have materially increased. Mining operations will be carried on at a greater depth. A very large proportion, almost the whole of the coal produced in Cape Breton, will be won from submarine areas, and while, to some extent, the same conditions will affect our competitors in the United States, we are and always shall be under a constant handicap by reason of the much simpler and less expensive mining operations which are possible in the coal fields of the United States that compete with Nova Scotia coal in the Montreal market.

A large body of earnest men and committees from associated scientific societies of the Empire are devoting their attention to trade after the war and the vast subject usually referred to (and, I think, somewhat misleadingly) as "Industrial Preparedness," which is a new term for the old virtue of efficiency.

As coal is the basis of all modern manufacturing industries it follows that the greatest efficiency of in-

dustries is obtained when they are located in the coal fields, thereby eliminating as a factor of expense unnecessary transportation. Although from the immediate viewpoint of the coal operators, the loss of the Montreal market may present a serious problem, yet from the larger viewpoint of Canada's national efficiency and certainly from the viewpoint of the province of Nova Scotia, there is a good deal to be said for a greater concentration of manufacturing activities within the coal fields of Nova Scotia. The transportation of millions of tons of coal, by water and by rail, to be used in the manufacturing industries of large centres of population, such as Montreal and Boston, is not really an efficient and economically sound proceeding.

These, gentlemen, are some of the problems facing those of us who happen to be engaged in the production of coal in Nova Scotia. The prospects, while their difficulties may stimulate us to still greater endeavor, do not promise a smooth road to travel. If we are to survive and hold our own in Canada, and, I may add, as a factor of world trade, in the days of depressed trade conditions which must inevitably follow the conclusion of the war, sooner or later; it is obvious that we must do two things, we must fully appreciate our difficulties and then proceed to overcome them. Greater difficulties have been overcome in the past in the coal trade of Nova Scotia, by study and concentration and by looking ahead of present conditions, and the road for us to-day is no easier than it was for our predecessors.

As the factor of increased cost is a certainty of the future in coal mining, we shall have to develop more efficient and therefore cheaper methods of mining practice. In such everyday problems as the haulage of coal, the mechanical cutting of coal and the mechanical loading of coal, we shall find opportunities for improvement, and we shall find as we have found in the past that best results follow naturally upon exchange of views among the men who have these problems before them every day.

No better medium for such exchange of thought and experience is to be found than a mining society. The apparent cessation of our activities during the past two years has been due to the greater urgency of our daily work, and I hope and believe that the future of our society will more than fulfil the promise of our first meeting in Sydney.

One lesson we have all learned recently is how to adapt ourselves to changed conditions, and I think we are all more alert and better men as a consequence.

My remarks would be incomplete if I were to conclude without voicing for this Society our appreciation of the honor that is to day reflected upon our profession by the presence on the firing line of more than a full brigade of Nova Scotia coal-miners. Many of these men have already given their lives. They could do no more. Nothing that I have said as to the influence of enlistments on the production of coal is intended in the slightest degree to dim our sense of pride in our own men or to diminish the glory of their patriotism and their achievements already recorded, and others that we have yet to hear of. The miners of Nova Scotia have played in this war the part of brave and generous men. They have given freely of themselves and their sons and their earnings. They have worked steadily in the production of coal, and in years that are to come the knowledge of good work done will be a pleasant remembrance to them, and to ourselves also.



### NOVA SCOTIA COAL PRODUCTION.

The production of coal in Nova Scotia is proceeding at the diminished level of the past six months, without any further marked decline, but without any increase or prospect of increase in the rate of production. Some falling-off in outputs may now be anticipated because of the usual exodus of men to farm work and fishing, and because of the general desire to move which is common in the spring.

The production of the Dominion Coal Company's collieries in April was about 330,000 tons, comparing with 370,000 tons in April 1916. The aggregate outputs for the first four months of the year show a decline over the first four months of last year of 210,000 tons.

For the first time since 1913 a certain activity is visible in new work and increased equipment at the collieries. The Dominion Coal Company is installing a 1500 kilowatt turbo-generator to increase the supply of electric power at the Dominion No. 2 Central Power Station, and step-up and step-down transformers are being provided for transmission purposes, the No. 2 Station being in electrical connection with the Waterford Station, distant some ten miles away.

A cross-measure drift is being driven from the Victoria Seam at No. 14 colliery to tap the Barrasois Seam lying above. The new seam will be worked to the same bankhead as the underlying seam. This work is being carried on in preparation for the time when the number of men available will allow increased areas of working to be taken in hand. No. 17 Colliery, also on the Victoria Seam, has been idle for three years, it being all ready to produce coal whenever men are available. Extensive overhauling and improvement of the haulage ways at No. 2 Colliery is also under way, with a view to the winning of the large tract of submarine coal that is tributary to the existing workings of this colliery. Similar work is going on in the Harbour Seam at No. 9 Colliery, which overlies the No. 2 workings on the Phalen Seam.

Unusual interest is being taken at the present time in the opening up of crop areas, abandoned collieries, and other sources which promise a quick production of coal without large capital expenditure and for immediate profit. This is a natural reflex of the high prices prevailing for coal. While in some cases the operation of these small areas may result in profits for those who originate the operations, it is not to be expected that any increase in the aggregate output of coal in the Province will be the result, for the workmen who will be attracted to the new openings will be to a large extent withdrawn from the mines of the larger companies. The small areas now being attacked are chiefly on the outcrop of the coal, and the work to be done is short and easy, particularly for men whose homes are, as is often the case, in the vicinity of the new openings. Also the work is rather more free and easy than in the larger and deeper mines, and the use of naked lights is permitted. These conditions are often more attractive to the miner than higher wages.

Labor matters are in an unsettled state at the Glace Bay collieries, and the Minister of Labor has appointed a Commission to investigate the request of the Provincial Workmen's Association for an increase in wages. The Commission which has been named seems admirably constituted, and it is to be hoped its labors will be effective in keeping the peace. The application

of the Provincial Workmen's Association for a Conciliation Board was refused by the Minister on technical grounds which seem to point to a necessity for some amendment to the Industrial Disputes Act. The P. W. A. in applying for a Board announced that in any case the Association would not sanction a strike under war conditions, and this patriotic and praiseworthy decision is the very thing which, strange as it may seem, defeats the application for a Board, because a Board of Conciliation is supposed to be granted to prevent a strike, and presumes a threat on the part of the dissatisfied party to strike or lock-out, as the case may be. However, the necessity for an increase of wages is not in dispute between the Coal Company and the P. W. A. It is merely a matter of what is the proper amount of the increase. With the steadily rising cost of living, it would appear that no settlement of wages can be more than temporary, and that some provision will have to be made to adjust the curve of wages to the curve of living, as variations become apparent.

### COAL BY-PRODUCTS EXPERIMENTS.

The Merritt Herald, Nicola, B. C., recently published the following:

Experiments now being conducted at a plant at Nanaimo, Vancouver island, British Columbia, to determine the by-product contents of coal from the Diamond Vale coal mine in Nicola valley, B. C., are reported as having thus far proved satisfactory. Walter Thomas, owner of the Thomas patent, is making the experiments with the coal for cooking purposes, and Dr. J. G. Davidson, Professor of Chemistry in the University of British Columbia, has charge of the electrical precipitation plant and the handling of the extracted by-products. Dr. Davidson will make a detailed report covering the entire experiment as soon as it shall have been completed.

It is understood, however, that the experiment thus far is checking up nicely with the results of experiments conducted in England on Diamond Vale coal sent there some time ago. The English experiments were conducted by J. Scott Anderson, a noted by-product expert. While as yet exact figures are not available, the volatile content, it is understood, averages close to 37 per cent. the valuable contents being motor spirit, light oils, heavy lubricating oils, paraffin oils (both light and heavy), and tar. A ton of Diamond Vale coal contains about 13 per cent. light oils, or approximately 20 gallons; 12 per cent heavy oils, or about 24 gallons; 4 per cent pitch, and 4.06 per cent sulphur ammonia.

The experiments now being conducted are by the low-temperature distillation process, the object being to recover as much as possible of the oil content of the coal. Coke may be produced either under a high or a low temperature. If, however, the coal is subjected to a heat above a certain temperature, the volatile contents are given off as gas. On the other hand, if the temperature is kept below a certain figure, not much gas is made, and practically the whole of the volatile matter is driven off and employed in the best possible manner for producing oils.

Another point that seems to be very favorable to the Diamond Vale coal as coke and by-product material is the fact that it contains very little sulphur and in the experiments that have been conducted this sulphur is reduced almost to the vanishing point, producing a coke that is valuable for use in steel works. In Sheffield, England, this class of coke is worth about \$8.50 a ton at the ovens. The greater part of the coal



found in British Columbia contains considerable sulphur, one of the notable exceptions being coal from the Diamond Vale seams, and the people who are now interested in the attempt to establish steel works in British Columbia are watching the experiments now being conducted at Nanaimo, for should they prove as successful as is expected, coke for the steel blast furnaces could then be obtained from Diamond Vale coal.

## GEOLOGY AND MINING IN NORTHERN ONTARIO.\*

By A. R. Whitman.

\*From an address to the Cobalt Board of Trade.

To those who dig in the earth for mineral, a knowledge of the earth must be useful; and the more of such knowledge one can apply in his mining, the better he should mine. There is scarcely a prospector or mine operator but uses geological knowledge or theories in his efforts to find ore. Even though he may denounce geology and geologists, nevertheless he continually attempts to apply geology in his daily work, and the practical miner is the most inveterate theorist there is. I say this to vindicate geology, before those who think it too theoretical for use.

Inasmuch as the earth is a maze of geological things, and mining is an attempt to pick the useful things out of it, therefore geology must be vital to mining; and on that assumption I will preface my remarks with a few words about the science of geology.

Science is man's effort to understand the world he lives in. It is not man's knowledge of that world of things and principles, but his effort to understand it. Man has not much real knowledge. Every now and then he finds that something he thought to be knowledge was only a false idea. But man has a great fund of effort for the acquisition of knowledge, and that effort with its earnings constitutes science. The earnings may or may not be knowledge! but the scientific attitude is that even though it may be false, it is intended merely to serve as knowledge until it is shown to be false, or until the truth is learned. In other words, true science is not dogmatic, but is open-minded. All knowledge is tentative.

Thus the scientific method is systematically and candidly to search for the truth of things. How could one get at the truth of things in a better way? Dogmatic assumptions would never get one there. Dogmatism is the great stumbling block to science. People can not know things by intuition. If that were the standard every man would have his own intuition, and they could not all be right. Nine hundred and ninety nine of them would be wrong. We have to prove things.

Scientific proof consists in taking evidence and in making logical deductions from evidence. There is a chance for falsity in the evidence and for fallacy in the deductions, so that our decisions are subject to double error. But this is the best way man has of finding out the truth of things.

I say this to offset the idea that science is a mass of facts and formulae that men can apply to problems and obtain instant and infallible solutions. A scientist is better able to solve problems than a layman, only because he understands better how to apply scientific methods of investigation, and because he is familiar with the experience of others along the same lines.

The earth is a nearly spherical mass of eight thousand miles in diameter, and man has been able to

penetrate into it something less than two miles. All we are familiar with is just the outer shell, which we call the earth's crust. We know the crust has pressure in it as if it were too large for the earth, because of the way it wrinkles up into mountain ranges, and the rocks shift every now and then along some line of fracture. We actually saw this happen in California in 1906 when the rock shifted ten feet on a line two hundred and eighty miles long, causing the earthquake which started the disastrous fire in San Francisco. The cause of this pressure may be subject to dispute, but we know the pressure is there, and that fact is one of the foundation facts of geology.

Another foundation fact is that rivers and streams gradually wear down the mountains and wash the material down onto the lowlands and into the sea, where shells and animal and plant remains become entangled in it, and the whole mass gradually solidifies into rock, making conglomerate, quartzite, greywacke, slate, and other rock.

Still another foundation fact is that vast masses of molten rock come from the interior of the earth up onto the surface, or harden into rock below the surface. When it flows out onto the surface it makes lava, and when it hardens below the surface it makes porphyry, diabase, gabbro, granite, and other crystalline rocks. It seems as if these intrusive rocks, as they are called, must have originally contained the metals, because in ninety-nine cases out of one hundred, igneous rocks are found near ore deposits. The relation is not that ore deposits are found near all intrusive rocks, but that all ore deposits are near intrusive rocks.

Sometimes it seems very certain that the ore deposits were derived from the intrusive rocks, as in the case of our local ore deposits, but I will discuss this later.

We know from mining experience that most everywhere underground, the rocks are full of water. It appears to be in the cracks, but probably that is just where it collects in greatest amount. It has been found by heating rock which appeared to be dry, that it contained a little water all through it. Probably ore deposits are formed by mineral being deposited out of this ground-water in cracks and sometimes in the pores of the rock. And the mineral got into the ground-water by being dissolved out of some nearby igneous rock.

### Geology of Cobalt Area.

The geology of Cobalt may briefly be summarized in a few paragraphs.

The Keewatin of which you hear so much is a group of greenish rocks, which are the oldest rocks we know of. We don't know what is under them. They contain old diabases and basalts and felsites and slates and other varieties which are of not much interest to us here. It is sufficient to call the whole set of them Keewatin.

In ancient times the Keewatin was an old land surface. It was eroded down nearly to a flat plane, and then sand and gravel was deposited over it in places to a considerable depth. All this became hardened into the rocks which we know as conglomerate and slate of the Cobalt Series or Huronian period. This was probably a very thick formation; and there must have been other formations above it.

In a later period a great mass of molten rock came slowly up from the interior and ran out horizontally along the bed of slate and conglomerate, under a great mass of rock which extended up to the surface of the earth. This molten rock in some places cut across the conglomerate beds and into the Keewatin. It was



injected along these lines until it finally attained a thickness of from seven hundred to twelve hundred feet. As it hardened it crystalized and made the formation which we now call the diabase sill.

After this, when the sill was pretty well cooled off, the pressure forces in the earth's crust begun to exert themselves in this region, and bent the rock up into big wrinkles or folds. At the same time, the rock was cracked, and here and there blocks of ground moved over one another, making faults. Most of this faulting was on flat faults that lay along the Keewatin-conglomerate contact, and along the diabase contacts, resulting in the production of more slips and joints in the contact regions than anywhere else.

Then came the ore. The ground-water by this time had permeated the diabase and other rocks; and the metals were dissolved out of the diabase and deposited in the conglomerate, and to some extent in the Keewatin within a few hundred feet of the diabase. It was deposited in vertical joints of the larger kind, because the smaller ones were not open at that time. When favorable joints of this sort lay in the diabase itself ore was deposited in them also.

The ore seems to have come mostly along the flat joints and flat faults, and along the contacts, depositing only in the vertical joints. For that reason ore can be expected chiefly near the contacts when they are flat or nearly so, or in places where flat joints and faults are abundant.

I can not go into all the details of where ore was and was not deposited, nor into the full explanation of the reasons for its peculiar selective behavior; but I will say that where small folds were formed on the sides of the large folds, the joints of the kind which the ore was deposited in, formed across the troughs or sags, and along the axes of the swells. This is a general rule, and has many exceptions.

That much has been done in the way of telling just where to look for ore. But it is of more benefit to mines than to prospectors. However, for the benefit of prospectors, I can say that these favorable conditions for finding ore, require that the formations shall be distinctly folded and faulted near the diabase, or that the diabase shall be strongly faulted, and jointed by flat joints which are very strong and closely set.

This does not mean that wherever one finds these conditions, he will find ore; but it means that these conditions are the most favorable.

#### Conditions at Porcupine.

In the Porcupine district it was found that a quartz porphyry had intruded the Keewatin schists, and that where it had become schistose itself bodies of gold ore lay near its contacts or on them. This ore may have originated in a somewhat similar manner to the Cobalt silver ores; but that is not certain. At any rate it appears that the rule I have stated holds good in a general sense.

#### Bearing on Mining Future of Ontario.

All these facts that I have stated, bear upon the mining future of Ontario. They mean that gradually a mass of experience is developing which will enable us to mine and explore in this north country to better advantage as time goes on. We are gradually learning what conditions control the occurrences of ore, and how to follow it, and find it again, when we lose it underground. We have learned something useful about Cobalt-silver ore deposits; and I have no doubt that

another Cobalt camp will some day be found in this diabase region. I do not believe the bush has been completely prospected, nor that the small and frequently erratic diggings on prospects that have been found have been altogether conclusive in demonstrating the outlook for ore.

Neither have the lessons of Porcupine been carried afield with sufficient thoroughness, and I confidently look for another Porcupine.

It is significant that Ontario's three greatest mining districts have been discovered on routes of travel. Sudbury and Cobalt were stumbled upon by railway construction; and Porcupine was stumbled upon through the accident of an old Hudson Bay trail crossing over one of the outcrops on the Hollinger property; and when the T. & N. O. Ry. approached near enough to make prospecting easy, then those prospects were opened up. What could be more obvious than that these rich mining districts are samples of Ontario.

But geology again comes to the fore in substantiating this conclusion. Geology says those samples must be representative. And these are the reasons why:

1. The whole region covered by pre-Cambrian rocks including Quebec, Ungava, Eastern Manitoba, Northern Saskatchewan, and the Northwest Territories is a vast mineral field, perhaps mineralized most richly in certain belts which remain to be determined, but nevertheless mineralized, through the medium of old intrusive rocks of various kinds, which lie among schists and ancient sediments. This condition the world over is productive of mineral.

2. Throughout Northern Ontario, these rocks are fractured by deep-seated faults, and more local fractures, and are here and there folded into more or less intense folds. And the world over, this condition, coupled with the other named, promises ore.

I hope I have not been too sanguine, I believe what I have said. And I have said it because I believe the conservative attitude heretofore held regarding the mineral resources of the north country are injurious to its proper development; and it is desirable that the people here and elsewhere should realize that the mining industry has only just begun to scratch its ultimate possibilities.

#### YUKON MINERAL CLAIMS LEASED.

Two quite important mining deals were closed on April 19 through Mr. Robert Lowe, said the Whitehorse Star. One of them was the taking of the lease, with an option to purchase, on the Fleming group of silver-lead claims in the Conrad district by Messrs. Angus R. McDougall, Carl Gaunt, Angus A. Gillis, and John McKenzie, all of whom were experienced miners and before the shut-down of the Pueblo mine comprised the crew of the diamond drill. There has been a lot of work done on this group and the lessees will resume the development at where it was discontinued when the close down was made. Mr. Fleming came down from Carcross for the purpose of making the necessary arrangements.

The other transaction mentioned was the leasing and bonding of the Retribution copper claim, adjoining the Empress of India, to Messrs. Jas. Hogan, Peter Patterson, Carl E. Anderson, J. L. Thompson, and Owney McFadden, comprising the Empress of India Mining Co. The Retribution is owned by Mr. G. Kydd, banker, of Ottawa, and Mr. G. M. SoRelle, a real estate man of Los Angeles, California.



J. A. E. AUDET  
Manager B. & A. Asbestos Co., Quebec.



H. H. LAVERY  
Superintendent St. Anthony Mine, Ontario.



OLIVER HALL  
Superintendent of Mines, Mond Nickel Co.



C. V. CORLESS  
Manager Mond Nickel Co., Ontario.





THOS. J. BROWN  
General Superintendent N. S. Steel & Coal Co., Ltd.



HENRY C. CARLISLE  
Superintendent Mandy Mining Co., Manitoba.



CHARLES SPEARMAN  
Manager Renfrew Molybdenite Mines, Ontario.



W. A. WILLIAMS  
Superintendent of Smelters, Granby Consolidated  
Mining, Smelting & Power Co., B. C.

## VOCATIONAL TRAINING FOR CRIPPLED SOLDIERS.\*

By F. H. Sexton.

\*A paper presented at the annual meeting Mining Society of Nova Scotia.

Every Canadian realizes that the problem of restoring our crippled soldiers to civilian life is one of the most serious tasks confronting the nations today. About 15,000 of these disabled men have come back broken in body and spirit and have been the means of stimulating the wisest provisions for their care, pensions, and employment that the country could develop.

The man who comes back from the front has been through experiences that make Dante's inferno seem like a Sunday school picnic. After the strain of war has been lifted from him, he is left like a man who has come through enormous nervous stress, or a heart-breaking sorrow. He is mentally sluggish and duller to sensation than he was normally. At first it was thought that he needed only a rest with incidental medical care and then he would be ready to take up his old tastes again. This treatment was sufficient for some, but it was soon found that the men deteriorated with idleness and inaction.

A comprehensive system of technical training was then developed, whereby every man in a convalescent home was given some classes for a certain number of hours per day, so that he would be kept occupied. The fact soon became apparent that the men were cured of their ills much more quickly if they were busy. It also became evident that many men could be so developed by vocational training that they would be prepared to go into civilian life better fitted to earn a living than they were before they enlisted. All of the technical education was made supplementary to the medical treatment of the men and was planned and carried out so that it would be as practical as possible.

At the present time classes are held in almost every convalescent home for four or five hours a day. In the district including Quebec, and the Maritime provinces, the following subjects are taught:

English, French, Arithmetic, preparation for civil service examination, Stenography, typewriting, Book-keeping, Mechanical Drawing, Electricity, Machine-tool Operating, Shoe Repairing, Woodworking, Motor Mechanics, Novelty Making, Poultry Raising and Market Gardening. In some cases special correspondence courses have been prepared for men who wished particular subjects which would be helpful to them and which could not be taught by the regular teachers.

In the sanatoria, where tubercular soldiers are treated, there are months of rest in the open air on verandahs, when the weather is not too severe, the men study, embroider, weave, and make baskets. When they have reached a certain point in their recovery they are allowed so many minutes of exercise every day, and go to the workshop and take up woodworking, sign painting, typewriting, motor mechanics and other studies. This is a new departure in the treatment of tuberculosis patients, because the method in most sanatoria has been that of complete rest with graduated exercise.

Many men have benefited themselves materially by vocational training during convalescence. Some have been able to take up positions of responsibility in their old line where they had been only ordinary workers before. A number have doubled their former wage earning capacity. Some soldiers have been able to

change from their former vocations, which they did not like, into more lucrative work into which they could put their whole heart.

Another portion of the vocational work which is more constructive is that which is called technically re-education. France and Belgium have carried this to a very high stage of perfection. In Canada we have followed their example. Any of our soldiers who returns with such wounds or disabilities that prevent him from following his old trade is a candidate for re-education in addition to his pension. He is guided into some calling for which he is fitted, given a thorough training for 6 months or a year free of charge and his dependents as well as he himself maintained at government expense.

This training is really necessary with a voluntary system of recruiting. Many men who had a good income enlisted in the rank and file. The pensions are awarded on the basis of physical disability, without reference to his earning power. Thus an engraver or barber with stiffened fingers from a wound might receive a pension of only \$10 or \$12 a month while he was totally prevented from following his old work. A coal miner with defective hearing might get only a small pension but could never go back to the working force again to ply his trade. The aim of the vocational re-education is always to train the man mentally so that he may be boosted into a higher position in the industry in which he was a worker, where his physical deficiencies do not detract from full earning power. No reduction is ever made in his pension by reason of any proficiency he may develop in his practical training.

Thus it is that the great instrument of technical education is employed to make reparation to the man who has suffered in fighting for the nation and the enlightened efforts are made to preserve each and every soldier as a self-respecting productive, independent citizen so that the great number of crippled men resulting from war shall not become whining, idle alms-mongers and pension hunters.

## VAN-ROI MINING COMPANY, LTD.

The report of the directors of the Van-Roi Mining Company, Ltd., prepared for presentation at the eighth annual general meeting of shareholders, convened to be held in London, England, on April 12th, consisted largely of the following: "The directors herewith submit the audited accounts of the company for the year ended September 30th, 1916. After writing off £1,613 8s. 9d. as depreciation on machinery, plant, buildings, etc., the accounts show a balance to the debit of Profit and Loss of £3,367 5s. 1d., which added to the amount brought forward from last year, namely, £5,139 17s 8d., gives a debit balance of £8,507 2s 9d., to be carried forward. Since the last general meeting negotiations have been conducted with various parties with a view to dealing with the company's property. The directors are now able to report that as a result an option has been granted on the property in December last on terms which are regarded as satisfactory under the circumstances.

About the middle of April it was reported from Whitehorse, Southern Yukon, that there was much activity in connection with the shipment of copper ore from Whitehorse district, the Yukon Copper, Ltd., Grafters, War Eagle, Empress of India, and Valerie having all been generous contributors to a considerable total output.



### HERB LAKE AND FLIN-FLON.

The Pas, Man.—E. L. Murray, locator of the Moose Mine at Rice Lake, came into The Pas on Saturday, after an inspection of Herb Lake district. He is much pleased with what he saw in that mining region.

The mining men and prospectors at Herb Lake are sadly in need of proper postal facilities. A petition is being presented to the department at Ottawa to grant an office at that busy mining spot.

Jack Callinan, accompanied by Zar Crittenden and two others, arrived in town from Flin-Flon and Schist lakes on Monday night. The party had quite a difficult time in crossing the lakes, owing to the breaking up of the ice, especially at Reeder lake, where they were held up for a day. Jack says his difficulties at this point in the journey were equalled only by Washington when he crossed the Delaware. Callinan took train for Sudbury, Ont., Wednesday afternoon.

Henry McCafferty has about finished corduroying the road into the lake from the H. B. Ry. line.

Hugh Vickers and Rod. McLeod are doing their assessment work on several Herb Lake and Snow Lake claims, and are making some very good finds of gold at the former and silver at the latter lake.

Mike Hackett and J. R. Campbell have made a rich find of free gold on the Bingo group.

Rex mine shaft is down to eighty-five feet. Latest assays of samples, made about two weeks ago, show values of \$100 to \$110 to the ton.

Dog teams are being used to bring in freight to the Herb Lake mines, as the horse teams are slower and insufficient.—The Pas Herald.

### LODE-MINING ON VANCOUVER ISLAND, B.C.

Mr. W. M. Brewer, of Victoria, B.C., in his paper on "Lode Mining Industry on Vancouver Island," read at the meeting of the Western Branch of the Canadian Mining Institute, in Vancouver, B.C., after mentioning that in 1898 there were on the island about 300 prospectors camped in the mountains and along tidewater from Sooke harbor to Quatsino sound, and that during the last 19 years he had examined most of the recorded mineral claims, stated that the metaliferous minerals of economic and commercial value occurring on the Island are gold, copper, silver (associated with copper), iron, and zinc, but only the three first-mentioned have been mined on a commercial scale. Gold-mining on the Island dates back to 1860, when placer-miners worked on Lecch river; prospecting for other minerals appears to have been begun in 1896 or 1897. Free gold in quartz was found in Alberni and other divisions, but gold-quartz mining has never been a commercial success on the Island. Outcroppings of copper and iron ores, however, are numerous in several parts, often being closely associated, but in some cases the percentage of copper renders the magnetite useless for iron making, while the copper value is not sufficiently high to give the deposit commercial value as copper ore. Deposits of copper and magnetite are usually found on the west coast of the Island, this type of ore being more numerous than others. Notwithstanding, though, that geological conditions are favorable and many of the outcroppings of copper show the ore to be of high grade, these deposits have not yet been sufficiently developed to produce many commercially valuable mines. There are many dumps containing from a few up to a hundred tons of ore ranging from 4 to 10 per cent. copper, situated

within two or three miles from saltwater. Some of these properties are Crown-granted, but owners not having capital to continue development and provide tramway, bunker, and wharf shipping facilities, mining work has been suspended and purchasers of the properties are being awaited. During 1916, however, there was a distinct revival of interest in the copper-mining industry, and several properties have been reopened and are being operated in a way that promises commercial success.

With regard to magnetite deposits of the contact metamorphic type, they are apparently of considerable extent and are found at several places on the west coast of the Island roughly paralleling the coast line, and usually within a few miles of safe deep-water harbors. It is not intended to here join in discussion, such as recently had taken place, chiefly by laymen, many of whom have never seen and could not find any of the magnetite deposits just mentioned, as to the quantity of iron ore available for immediate shipment if a blast-furnace was built, but the subject of lode-mining would not be done justice to without reference being made to the considerable extent of these occurrences of magnetite. While the writer is not prepared to estimate the tonnage, except in a very rough way, he feels fully justified in expressing the opinion that so far as the quantity of magnetite ore available is concerned there need be no hesitancy in starting a local iron industry provided demand, cost of production, etc., are favorable. The development work done on the various deposits of magnetite has not been such as to determine available tonnage of ore, but only sufficient to enable owners to Crown-grant the mineral claims and await the day, which is bound to come sooner or later, when the iron-ore properties will be in demand.

Copper-ore deposits have heretofore been proved of most commercial value, the Tyee and other Mt. Sicker mines having previous to 1908 produced a grand total of approximately 250,000 tons of ore that averaged 5 per cent. copper, beside 3.5 oz. silver and \$3.50 gold to the ton. Recently the Tyee Copper Co.'s property was acquired by capitalists who are preparing to reopen the smelter at Ladysmith, after enlarging its smelting capacity, installing a copper converter plant, and making other improvements. It is stated, also, that it is proposed to again work the Tyee mine.

There are also the Sooke type of copper ore deposits, as distinguished from the Tyee type. On Mount McGuire, Sooke peninsula, there are several deposits on which development work has been done. From one of these, the Willow Grouse, various shipments of copper ore have been made during the last two years; some of this ore yielded as high as 11 per cent. copper, besides giving small value in gold and silver. This ore is chalcopyrite, with which iron pyrites is occasionally associated. The gangue material is chiefly hornblende. The deposit occurs in a shear zone, having a width of about 80 ft., in which there is an enriched shoot of high-grade chalcopyrite, from which the ore shipped was mined. This oreshoot filled a well-defined fissure in the shear zone, about 7 ft. wide and 150 ft. long. The lessees who since 1915 operated the property made little attempt to prospect beyond the boundaries of the ore shoot, but general conditions appear to be favorable and point to the possibility that by boring with a diamond drill other enriched ore shoots may be discovered as well as otherwise proving the mineralization of the shear zone.



## SPECIAL CORRESPONDENCE

### NORTHERN ONTARIO.

#### Gowganda.

It is understood that steps may be taken in the near future to improve the roadway between Gowganda and Elk Lake, which is the nearest point of railway to the Gowganda Camp. Recent developments in the district, notably that at the Miller-Lake O'Brien, where one of the largest silver deposits in the North Country has been developed, together with active operations on other properties has emphasized the great need of better transportation facilities. A number of the important operators in the district propose co-operating in macadamizing the road.

#### Temiskaming.

Exploration work at the 1600-foot level of the Temiskaming is being energetically carried forward with a view to the thorough exploration of the ground immediately below the contact and also in an endeavor to cut the vein encountered some time ago on the Beaver. The shaft will also be continued to the 1800-foot level, where extensive exploration work will be done.

#### Nipissing.

The annual report of the Nipissing Mining Company for the year 1916 showed the company to have made net profits of over \$2,000,000, and the ore reserves were estimated at over 9,000,000 ounces. This remarkable result was achieved in spite of the fact that supplies of all kinds have increased considerably in value, and higher wages have been paid the men in the employ of the company. The average price received for silver for the year was 65.661, compared with 49.684 for the preceding year. The cost of producing silver was 24.13c., compared with 19.06c., for 1915. More than \$193,000 was added to the cash surplus of the company, which now amounts to \$1,980,126. The company's insurance and war taxes cost \$111,000 more than in the preceding year. Developments underground were very satisfactory and new ore was opened up to replace all that was extracted from the mine, with the result that the ore reserves are slightly higher than they were at the close of 1915. The outlook for the coming year is considered very bright.

#### Kerr Lake.

Production at the Kerr Lake during the month of March was the highest for any month since last August, and resulted in the extraction of 219,335 ounces. It would not be surprising if the production for 1917 at the Kerr Lake surpassed that of the preceding year, when it is estimated 2,533,805 ounces of the precious metal was recovered.

#### Hollinger.

The deepest working at the Hollinger gold mine in Porcupine is 1,250 feet. Nearly fourteen miles of underground work has been done. Over 110 machines are working and 1,100 men are employed on the property. It requires nearly 5,000 horse power to drive the machinery at the mine. The milling capacity is now 1,800 tons per day and within a few months it will probably be between 3,600 and 3,800 tons. The ore reserves are estimated at over \$34,000,000. Owing to the increased cost of supplies and the inefficiency of labor at present employed, it is understood that the costs at the big mine have increased between 75 and 80 cents per ton of ore treated, over pre-war costs. Much energy is being concentrated on development underground to meet the anticipated increase in the amount of ore which will be required to keep the mill

operating to capacity when the new additions are completed.

#### Hollinger Reserve.

The shaft at the Hollinger Reserve mine in Ogden Township is being sunk from the 300 to the 400-foot level and results obtained to date are said to be very encouraging. The vein in the shaft at the present depth, which is a little over 300 feet, is the full width of the working and is said to contain considerable free gold. To date approximately 2,080 feet of development work has been done underground on the property and a substantial amount of ore has been indicated as well as a large quantity which has been placed on the dumps from development work. A first-class mining plant has been installed and from this time forward the property will be energetically developed. The installation of a small ball mill which was to have taken place this spring, has been postponed for the time being.

#### Rypan.

A company known as the Rypan Porcupine Mines Limited, is commencing operations on the property in Deloro Township. The claims of the company are located about a mile south of the Coniagas property and comprise 190 acres. The work done so far has been very gratifying, and until the present time has been financed privately. The country rock is Keewatin greenstone and shows a large schisted zone striking east and west, averaging about 150 feet in width. It is in this zone that several veins have been discovered. Quartz bodies parallel each other with the intervening schist, the fractures being filled with secondary quartz. This vein matter is more or less impregnated with iron and copper pyrites. Assays are said to have been encouraging.

#### Elliott-Kirkland.

A payment of \$25,000 was made on the Elliott-Kirkland property a short time ago at Haileybury by Frank L. Mapes and his associates at Rochester. The property has been quietly but very aggressively developed since it changed hands with the result that a small electrically driven plant has been installed and a shaft sunk to a depth of a little over 100 feet. When the 125-foot level is reached a crosscut will be run for the purpose of encountering the vein of the Kirkland Lake Gold, which it is expected will be located with little difficulty. Where the vein of the Kirkland Lake gold is expected to enter the Elliott-Kirkland property the ground is low and wet, which led to the sinking of the shaft on the high ground between 50 and 100 feet from the strike of the vein.

#### White Reserve.

The cross-cut on the 140-foot level of the White Reserve property at Elk Lake has already cut two veins, and at shaft 21, at a depth of 40 feet, considerable high-grade ore is in sight. The high-grade is being bagged and a small shipment will be made after the drying up of the roads. At present the snow is still four feet deep in the gullies and wooded areas. The White Reserve is equipped with a 9-drill compressor and two machines and a force of about 20 men are at present employed at the property.

#### Kowkash.

According to recent reports from the Tashota section of the Kowkash district on the Transcontinental railway, results of development work there during the past winter have proven very favorable, and it is expected that the coming summer will be an active one. About 100 feet of drifting has been done each way on



the vein at the Tash-Orn mine, from the 100-foot level. The vein is the full width of the drift and is said to contain very good values. The plant installed last fall is working smoothly and development work will be continued. A number of prospectors have remained on their holdings in this district all winter and test pits have been sunk on veins, which have been more or less encouraging.

#### **Charlton Power Plant.**

The Charlton and Englehart Light and Power Company's plant which help to generate the supply of power for the Kirkland Lake Camp has been taken over by the Northern Ontario Light & Power Company. The plant supplied Charlton and Englehart with light and power and also distributed a quantity to different mining enterprises in the vicinity, having a capacity of 1000 horse power. It will be a valuable acquisition to the already extensive equipment of the N. O. L. & P. Co., which is endeavoring to keep pace with the ever increasing demand for electric energy by the new mining districts of the North.

#### **Hurd.**

The Hurd property at Kirkland Lake, under option to the LaRose Mining Company of Cobalt, is being developed with all possible speed. The shaft has reached a depth of 100-feet and while the assays at this point are not so high as at the 60-foot level where free gold was encountered, they are said to be encouraging. The vein is the full width of the shaft and heavily mineralized. Diamond drilling will be commenced on the property at an early date.

#### **Boston Creek.**

The O'Donald claim at Boston Creek, which has been held under option for some time by interests closely associated with the Crown Reserve Mine at Cobalt, has reverted to the original owners. It is understood the conditions of the option were not fulfilled regarding the amount of work which was to have been done each month, and the owners notified the company that their option was at an end.

#### **Murray-Mowbridge.**

The initial plans for development at the Murray-Mowbridge property at Wolfe Lake, near Bourke's Siding, consist of the sinking of the shaft to the 300-foot level and doing lateral work at this depth. The plant has arrived at the property and is being installed. The old 50 foot shaft has been re-timbered and the work will be continued from this depth.

#### **Kirkland Midas.**

Last week a vein was uncovered on the Kirkland Midas Company's property at Kirkland Lake, where exploration work is being carried on. The vein was several feet in width and highly mineralized, although gold values are comparatively low.

#### **Staking in Bisley Township.**

About twenty claims have been staked in Bisley township, which is situated between Morrisette and Thackeray. Free gold is reported to have been discovered in Bisley, which led to the staking of the claims. While nothing spectacular has so far been reported, the new find is said to be worthy of attention.

#### **New Find at Croesus.**

Another high grade discovery is reported to have been made on the Croesus property in Munro township. The new discovery was made in the west crosscut at the 300-foot level. The vein was in evidence on the surface and while free gold was found in places the values were not consistent. However, at the 500-foot level the ore is said to be high grade, and while not in its free state, being associated with pyrites, it is said to be of much importance. Work on the new mill

is being prosecuted vigorously in an effort to have it completed by the end of the summer. A number of promising prospects in Munro Township and the Painkiller Lake district will see much activity this coming summer.

#### **Silverado.**

The mining plant for the Silverado Mine at Gowganda has been taken in and is being installed at the present time, with the intention of pursuing an aggressive development campaign on their property this coming summer. The taking in of the 110-ton boiler gave a good deal of trouble owing to the condition of the roads.

#### **La Belle Kirkland.**

The La Belle Kirkland mining company at Kirkland Lake have tested the property by diamond drilling and a contract for 5,000 feet has just been completed. It is understood the results proved so highly satisfactory that it is the intention of the company to let a similar contract immediately. The deepest hole attained a vertical depth of 700 feet, where the main vein was cut and values were found to be consistent with those encountered in the workings of the mine around the 300-foot level. A number of low grade veins of more or less importance were also encountered.

#### **Refining Flotation Concentrates.**

Mr. Holt of the Holt-Dern Furnace Co., of Salt Lake City, Utah, has been in the camp, making experimental tests in the refining of the product from the Oil Flotation process, which a large number of the Cobalt mines are now using. It has formerly been necessary for the mines to ship this product out of the country for refining, at a cost which was a serious drawback to the complete success of the method in Cobalt. It is understood that the experiments have proven successful and that there is a possibility that in the near future it may be possible to reduce the product to the bullion form in the camp. The Holt-Dern process consists of a chloridizing roast followed by a salt leach or cyanidation. It is a simple invention and may be operated economically. The experiments are being carried out at the Dominion Reduction and Buffalo mine.

#### **Boston Creek.**

The winze on the Boston Creek property in Boston township, has reached a depth of 400-feet, at which point several inches of high-grade and between four and five feet of good grade mill rock is showing in the working. The winze will be continued to deeper levels. The staff of forty-five men are now comfortably quartered in their new buildings. The office and other camp buildings are also completed. According to rumor there is a deal pending which may involve control of the Boston Creek mine.

#### **Wright Claims.**

A test shipment of iron pyrite ore was recently made from the Wright property at Bobs Lake, to Ottawa. The sample was taken over a width of 26 feet and 77.1 per cent. of the sulphur content was recovered. The Wright claims are in Whitney Township and consist of six forty-acre claims. Considerable exploration work in the form of tunnelling and open-cutting has been done.

#### **Canadian Kirkland.**

A large amount of stripping and trenching has been done on a number of veins on the Canadian Kirkland mining company's property, located a short distance south of the Teck-Hughes and Tough-Oakes in the Kirkland Lake district. Five promising veins have been uncovered and assays ranging from \$2 to \$20 have been obtained, while free gold is also said



to be showing in a number of places on the number four vein. It is on this vein that the test pits will be sunk. The work is under the direction of Mr. George Tough, who is managing director of the company.

#### National Mines.

The crosscut at the 400-foot level of the National Mines Co., Cobalt, has been carried to the old Silver Cliff property which adjoins it. A number of promising leads have been cut, which will be followed up at a later date. A new 5 x 20 ball mill is to be added to the equipment of the plant at an early date and it is expected that the oil flotation plant will be working to capacity by the first of June. A new classifier and a large sand pump have also been installed recently.

#### McKinley-Darragh.

If no delays are encountered the new flotation mill to treat the tailings from the McKinley-Darragh, should be in operation by the middle of August. Construction work on the new buildings was commenced last week. Underground work at the McKinley is proving very favorable. The main shaft has been completed to the 400-foot level and it is stated that the grade of ore being obtained on the lower levels of the mine is much higher than that on the upper. At some points the conglomerate, which took an unexpected dip, goes a considerable distance below this level and adds much to the possibilities of the mine. It is expected that the ore reserves of the mine will show a material increase by the end of the present year.

#### Kirkland Lake Gold.

It is reported that the grade of ore encountered in the main vein of the Kirkland Lake Gold at the 600-foot level is better than that found on any of the levels above. Sinking is being continued to the seven hundred foot level, and it is understood to be the intention of the company to install a hundred ton mill before many months.

#### McRae Porcupine.

A plant consisting of a 100-h.p. boiler, 3-drill compressor and hoist has been installed at the McRae Porcupine property and mining operations have been resumed with the intention of sinking the shaft to the 150-foot level and doing exploration work at this depth. Besides the large sulphide dyke, four parallel veins will be explored. The property is located in the eastern portion of the township of Deloro, about two miles from Tisdale.

#### Thompson-Vipond.

With the mill treating around 100 tons daily and heads averaging close to \$10 per ton, the Vipond-N. T. property is being rapidly developed. The main vein was encountered this week at the 600-foot level and was found to be about twenty feet in width, carrying values which compare very favorably with those of other levels of the mine. The management proposes drifting on the vein from the North Thompson side to a point directly under the old Vipond workings when the workings of the two properties will be connected at this depth, providing more efficient ventilation and ore transportation.

#### Hunton.

Development work will be commenced this week on the Hunton property at Kirkland Lake. The old shaft which is down to a depth of forty feet will be pumped out and work resumed from this depth. Considerable exploration work has been done on the surface of this property from time to time, and about three years ago,

some very spectacular ore was encountered. The company owns approximately 78 acres, which ties onto the Orr claims and is less than half a mile south of the McKane claim of the Kirkland Lake Gold. At the time the war broke out, the Hunton was under option to an English company, but work was discontinued and the option allowed to lapse. Where the vein was tapped at the forty foot level it was found to be lower grade than on the surface, but to have attained a width of three feet.

#### Dome.

The Dome Mines at Porcupine have been forced to curtail production, owing to the scarcity of labor throughout the North country. With the curtailment of the output of the big mine comes the announcement that the dividend will be cut in half. It is understood that the mill has only been running at about two-thirds capacity since early in April and the net profit has fallen below that required for dividend purposes.

#### The Wages Question.

The Annual District Convention of Miners assembled here this month did not serve to improve the outlook for a settlement of differences between the mine operators and their employees. As a matter of fact, it would now appear almost certain that the demand for increased wages will be pressed regardless of consequences. Officials of the Union have stated that the plan of procedure decided upon is to write the mine operators in the near future asking for a conference. The mine operators will be given ample time to reply, and if at the expiration of that time, no settlement is reached, further steps will be taken. It was the unanimous opinion of all the members present that individual strife or friction was to be avoided so long as any hope remained for a peaceable settlement. No provocative steps would be countenanced, and if, as a last resort, the mine workers have to make use of the only method at their command, the convention felt confident that the fault will not rest with the employees.

Not a few mine managers have openly stated they will not meet the committee of the Union in conference, and it is the consensus of opinion that they will not deviate from this attitude.

#### BRITISH COLUMBIA.

The earlier favorable outlook for an uninterrupted continuance of mining activity in the interior mining districts of the Province, is not being realized. On the other hand, the situation appears to be gradually becoming worse, with a prospect of a wages dispute between metalliferous miners and mine operators threatening. Men are leaving Rossland camp, where all mining operations are stated to have been suspended; some have gone to Camp Hedley, Similkameen; others to camps to the eastward of the Columbia river where it flows through West Kootenay, and numbers of others have crossed the International Boundary line on their way to active mining districts in the North-western States. So long as the Crow's Nest labor troubles shall remain not settled, the mines of Kootenay and Boundary must of necessity be adversely affected. Apart from this, though, there is trouble being stirred up by the Western Federation of Miners among the miners in West Kootenay.

#### WEST KOOTENAY.

Ainsworth.—Seven men are now working at the Cork-Provence mine, on the south fork of Kaslo river. It is intended to sink a double-compartment shaft, but



the work of cutting out a station for it has not yet been commenced.

The backward spring is adversely affecting development of mining properties up the South Fork. A report from the Index mine, higher up than the Cork-Province, is that the snow that far up the South Fork valley has not yet commenced to move, while each fresh snow storm piles up a further quantity of snow. No bad slides have yet come down to the wagon road.

Slocan.—Both mining and concentrating silver-lead-zinc ore has been resumed at the Galena Farm mine and mill near Silverton, Slocan lake, and the prospects are believed to be good for a favorable summer run. There were reports lately of negotiations for the purchase of this property but nothing definite seems to have resulted as yet. The prospective purchasers are reported to be seeking to acquire neighboring mining properties before concluding negotiations for the purchase of the Galena Farm.

Trail.—Last month the Consolidated Mining and Smelting Company of Canada, Ltd., issued a statement to its employees, stated to number nearly 3000 in all at mines and smelting works, regarding the situation in connection with the demands made for an increase in wages. The statement follows:

Trail, B. C., April 17, 1917.

"To all Employees;

"During the past fortnight officials of District 6, Western Federation of Miners, have made demands on behalf of all our employees in District 6 for an increase of 50 cents per day, and also for the check-off system.

"In the past the policy of the company has been to treat with committees at each of our camps regardless of whether or not members of the committee belonged to a union.

"We have told the officials that this policy will be adhered to. We have said that we considered it impracticable for one committee to represent all of the camps, because no two camps work under the same or even similar conditions, and that therefore each camp should select its own committee, which we will be glad to meet at any time.

"In granting the War bonus effective after March 31st, we did more than our profits justify, but we shall welcome a discussion with your committee as to the fairness of our position.

"Mr. J. D. McNiven is here. He represented the Minister of Labor last year when the existing contracts were agreed on. His presence should be taken advantage of to bring about an amicable understanding.

"We sincerely hope that the long-time friendly relations may be continued, especially as our output of metals is so vitally necessary for our men at the front, who are risking everything for our protection."

It is reported in up-country newspapers that all the copper blast furnaces at Trail are inoperative, only the lead furnaces now being in blast. The electrolytic zinc department is still being operated.

#### BOUNDARY.

News from Phoenix is to the effect that on the evening of April 26th, the Granby Co's mines in that camp were closed for a period of from ten days to two weeks,

or until such time as coke shall begin to again reach the smelting works at Grand Forks.

The comment of the Grand Forks Gazette on April 28 was as follows: "The Granby Co's smelter in this city, which has been operating only three of its eight blast furnaces for the past week, will probably be forced to close the smelter early next week through lack of coke, occasioned by the continued strike of coal-miners in the Crow's Nest Pass. The mines at Phoenix are also temporarily closed. For the same reason the smelter at Trail and the mines at Rossland are now idle. Unsettled labor conditions in the coal mines have seriously interfered with the production of metalliferous minerals, through lack of coke for smelters, for nearly eight months. The outlook at present is not particularly encouraging."

#### YALE.

Nicola Valley.—The Donohue Mines Corporation recently installed on its property at Stamp Lake, in Nicola district, a 30-ton concentrating mill, designed by Mr. Bernard T. de Ulrich, of Seattle, Washington, to treat complex ores of the Tubal Cain, King William, and Joshua mines, the ores of which contain copper, lead, zinc, silver and gold. A "balanced rod" mill is used for grinding and Monarch concentrators. The Joshua and King William mines are developed by shaft, that of the former being 400 ft. deep with levels each 100 feet; the Tubal Cain is opened by tunnel, following the vein for more than 300 feet. Some crude ore has been shipped to smelting works for a bulk test of its valuable contents. Quite recent reports are that concentrate has been made and is awaiting shipment, but for the time being the wagon road is not in good condition for heavy hauling between the mine and the railway. Mr. Frank M. Hawkes is manager of the company, and Mr. James McKieran, superintendent.

From another source it is learned that Dr. E. W. Bridgman, of Vancouver, B. C., one of the directors of the Donohue company, who was at the mine recently, on his return to Vancouver expressed himself as being well pleased with the new concentrating plant recently put in and now operating on the company's property.

Improvements continue to be made at the Diamond Vale No. 3 mine, near Merritt, the latest being a new tippie, which is being erected to facilitate the screening and handling of coal for the local market. The Merritt Collieries, Limited, the company operating the colliery, expected to have this tippie completed by the end of April. Hitherto this mine has only been able to supply mine-run coal to the local market, but hereafter it will be practicable to deliver lump coal as well.

#### MAGNITUDE OF SUDBURY NICKEL INDUSTRY.

The large bodies of nickel-copper ore in the Sudbury district are, all things considered, the most important and valuable of the mineral deposits yet found in Ontario. Their working requires more labor than the mines of any other branch of the industry. Their number and dimensions are such as to predicate a long life for the nickel business, and to fully warrant the large investments of capital which have been and are still being made for their equipment and operation. The profits realized by nickel mining companies of late years have been large, and were never larger than at the present moment.

## MARKETS

## SILVER PRICES.

|       |         | New York.<br>cents. | London.<br>pence. |
|-------|---------|---------------------|-------------------|
| April | 21..... | 72 $\frac{7}{8}$    | 37                |
| "     | 23..... | 74 $\frac{3}{4}$    | 37 $\frac{1}{8}$  |
| "     | 24..... | 73 $\frac{1}{4}$    | 37 $\frac{3}{8}$  |
| "     | 25..... | 73 $\frac{1}{2}$    | 37 $\frac{5}{8}$  |
| "     | 26..... | 73 $\frac{1}{2}$    | 37 $\frac{5}{8}$  |
| "     | 27..... | 74 $\frac{1}{8}$    | 37 $\frac{5}{8}$  |
| "     | 28..... | 74                  | 37 $\frac{5}{8}$  |
| "     | 30..... | 74 $\frac{3}{4}$    | 37 $\frac{1}{8}$  |
| May   | 1.....  | 74 $\frac{3}{8}$    | 34 $\frac{3}{4}$  |
| "     | 2.....  | 74 $\frac{5}{8}$    | 37 $\frac{7}{8}$  |
| "     | 4.....  | 75 $\frac{1}{8}$    | 38 $\frac{1}{8}$  |
| "     | 5.....  | 74 $\frac{7}{8}$    | 38                |
| "     | 7.....  | 74 $\frac{3}{4}$    | 37 $\frac{1}{8}$  |

## TORONTO MARKETS.

|                                                                    |
|--------------------------------------------------------------------|
| Cobalt oxide, black, \$1.05 per lb.                                |
| Cobalt oxide, grey, \$1.15 per lb.                                 |
| Cobalt metal, \$1.25 to \$1.50 per lb.                             |
| Cobalt anodes, \$1.50 to \$1.75 per lb.                            |
| Nickel metal, 45 to 50 cents per lb.                               |
| White arsenic, 5 $\frac{1}{2}$ to 6 cents per lb.                  |
| May 9, 1917—(Quotations from Canada Metal Co., Toronto)            |
| Spelter, 13 cents per lb.                                          |
| Lead, 12 $\frac{3}{4}$ cents per lb.                               |
| Tin, 58 cents per lb.                                              |
| Antimony, 30 cents per lb.                                         |
| Copper, casting, 34 cents per lb.                                  |
| Electrolytic, 36 cents per lb.                                     |
| Ingot brass, yellow, 23 cents; red, 25 $\frac{1}{2}$ cents per lb. |
| May 9, 1917—(Quotations from Elias Rogers Co., Toronto)            |
| Coal, anthracite, \$9.50 per ton.                                  |
| Coal, bituminous, nominal, \$8.50.                                 |

## NEW YORK MARKETS.

|                                                                     |
|---------------------------------------------------------------------|
| Connellsville Coke—                                                 |
| Furnace, spot, \$7.25 to \$7.50.                                    |
| Furnace, contract, \$8.00.                                          |
| Foundry, spot, \$9.50 to \$10.50.                                   |
| Foundry, contract, \$8.50 to \$9.25.                                |
| Straits tin, spot, f.o.b. nominal, 59.00 cents.                     |
| Copper—                                                             |
| Prime Lake, nominal, 31.50 to 32.50 cents.                          |
| Electrolytic, nominal, 32.00 to 33.00 cents.                        |
| Casting, nominal, 29.50 to 30.00 cents.                             |
| Lead, Trust price, 9.50 cents.                                      |
| Lead, outside, nominal, 10.00 to 10.50 cents.                       |
| Spelter, prompt western shipment, 9.30 to 9.42 $\frac{1}{2}$ cents. |
| Antimony—                                                           |
| Chinese and Japanese, nominal, 24.00 to 25.00 cents.                |
| Aluminum—nominal.                                                   |
| No. 1 Virgin, 98-99 per cent., 59.00 to 61.00 cents.                |
| Pure, 98-99 per cent. remelt, 56.00 to 58.00 cents.                 |
| No. 12 alloy remelt, 40.00 to 42.00 cents.                          |
| Powdered aluminium, 85.00 to 90.00 cents.                           |

## STOCK QUOTATIONS.

As of close May 8th, 1917.

(By courtesy of J. P. Bickell &amp; Co., Toronto.)

New York Curb.

|                            | Bid. | Asked. |
|----------------------------|------|--------|
| Boston and Montana .....   | .64  | .66    |
| Butte-Detroit Copper ..... | .37  | .50    |
| Canada Copper .....        | 1.75 | 1.87   |
| Dome Extension .....       | .16  | .18    |
| Hargraves. . . . .         | .11  | .12    |

|                               |                    |       |
|-------------------------------|--------------------|-------|
| Inter. Petroleum .....        | 13.00              | 13.25 |
| Kerr Lake .....               | 4.50               | 4.62  |
| La Rose Con. ....             | .43 $\frac{3}{4}$  | .50   |
| McIntyre .....                | 1.56 $\frac{1}{4}$ | 1.60  |
| N. Amer. Pulp and Paper ..... | 4.75               | 5.00  |
| Nipissing .....               | 7.25               | 7.50  |
| Superstition .....            | .28                | .30   |
| Temiskaming .....             | .38                | .40   |
| Vipond .....                  | .38                | .40   |

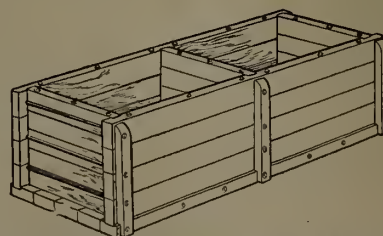
## Ontario Gold Stocks.

|                          | Bid.              | Asked.            |
|--------------------------|-------------------|-------------------|
| Apex .....               | .06 $\frac{1}{4}$ | .06 $\frac{1}{2}$ |
| Boston Creek .....       | .75               | .79               |
| Dome Extension .....     | ...               | .16 $\frac{1}{4}$ |
| Dome Lake .....          | .17 $\frac{1}{2}$ | .18 $\frac{1}{2}$ |
| Dome Mines .....         | 12.75             | 13.00             |
| Hollinger Cons. ....     | 4.65              | 4.70              |
| McIntyre .....           | 1.54              | 1.55              |
| Moneta .....             | .11               | .12 $\frac{1}{2}$ |
| Newray .....             | .75               | .80               |
| Porcupine Crown .....    | ...               | .60               |
| Porcupine Imperial ..... | .03               | .04               |
| Vipond .....             | .36               | .39               |
| Preston E. Dome .....    | .04 $\frac{1}{4}$ | .04 $\frac{1}{2}$ |
| Schumacher .....         | .41               | .49 $\frac{1}{2}$ |
| Teck Hughes .....        | ...               | .50               |
| West Dome .....          | .20 $\frac{1}{4}$ | .20 $\frac{1}{2}$ |
| Thompson Krist .....     | .11 $\frac{1}{2}$ | .12 $\frac{1}{2}$ |

## Cobalt.

|                               | Bid.              | Asked.            |
|-------------------------------|-------------------|-------------------|
| Adanac .....                  | .10               | .15               |
| Bailey .....                  | .03               | .04               |
| Beaver Cons. ....             | .33 $\frac{1}{2}$ | .36               |
| Buffalo .....                 | ...               | 1.40              |
| Chambers-Ferland .....        | .08 $\frac{3}{4}$ | .10 $\frac{1}{2}$ |
| Great Northern .....          | .11               | .11 $\frac{1}{2}$ |
| Hargraves .....               | .11 $\frac{1}{2}$ | .11 $\frac{3}{4}$ |
| Hudson Bay .....              | 35.00             | ...               |
| Kerr Lake .....               | 4.40              | ...               |
| La Rose .....                 | .45               | .52               |
| McKinley-Darragh-Savage ..... | .51               | .52               |
| Nipissing .....               | 7.30              | 7.35              |
| Peterson Lake .....           | .09 $\frac{1}{4}$ | .10               |
| Shamrock Cons. ....           | .20               | .21               |
| Temiskaming .....             | .38 $\frac{1}{2}$ | .39               |
| Trethewey .....               | .11               | .12               |
| Wettlaufer .....              | .05               | .06               |

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The Company continues the notice of the former owners of these patents that it is ready to grant licenses for the use of this process to those who wish to install and use it in Canada, as well as in other parts of North America.

Notice is hereby given that suit will be brought against infringers to restrain all unlicensed use of the process and to recover all profits acquired by such unlawful use.

The Company maintains a laboratory for testing ores by flotation and samples sent to its chief engineer, Mr. Edward H. Nutter, at its San Francisco address will be tested at minimum expense to prospective licensees.

This process has been extensively used under license from the patentees the world over, in Australia, Europe, South America, Africa, West Indies, United States of America and Canada. The Braden mines in Chili, the Anaconda and Inspiration mines in the United States, and the Britannia mines in Vancouver are noted examples of this successful use. The process treats the entire milled product of crude ore, including the finest slimes.

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Can. Fairbanks-Morse Co.
- Ball Mills—**  
Fraser & Chalmers of Canada, Limited.  
Hull Iron & Steel Foundries, Ltd.
- Belt—Leather, Rubber and Cotton—**  
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Northern Canada Supply Co.
- Blasting Batteries and Supplies—**  
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Curtis & Harvey (Canada) Ltd.  
Northern Canada Supply Co.  
Canadian Explosives, Limited
- Blowers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Boilers—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd
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Standard Underground Cable Co. of Can., Ltd.
- Buckets—**  
Can. Fairbanks-Morse Co.  
Hendrick Mfg. Co.  
M. Beatty & Sons, Ltd.  
Northern Canada Supply Co.
- Cable — Aerial and Under-ground—**  
Fraser & Chalmers of Canada, Ltd.  
Northern Canada Supply Co.  
Standard Underground Cable Co. of Can., Ltd.
- Cableways—**  
Fraser & Chalmers of Canada, Limited.  
M. Beatty & Sons, Ltd.
- Cages—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cables—Wire—**  
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- Car Dumps—**  
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- Cars—**  
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W. Fraser.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cement Machinery—**  
Northern Canada Supply Co.  
Hull Iron & Steel Foundries, Ltd.
- Chains—**  
Can. Fairbanks-Morse Co.  
Jeffrey Mfg. Co.  
Jones & Glassco  
Northern Canada Supply Co.  
B. Greening Wire Co., Ltd.
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Canadian Laboratories.  
Campbell & Deyell.  
Thos Heys & Sons.  
Milton Hersey Co.  
Ledoux & Co.
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Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters—**  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Dock Bridges—**  
Roberts & Schaefer Co.
- Coal Mining Explosives—**  
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Canadian Explosives, Limited
- Coal Mining Machinery—**  
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Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.  
Sullivan Machinery Co.
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Can. Ingersoll-Rand Co., Ltd.
- Coal Washeries—**  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.
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Roberts & Schaefer Co.
- Compressors—Air—**  
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Darling Bros., Ltd.  
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W. Fraser.  
Smart-Turner Machine Co.  
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Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Concentrators and Jigs—**  
Fraser & Chalmers of Canada, Limited.
- Concrete Mixers—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Wettlaufer Bros.
- Condensers—**  
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Northern Canada Supply Co.
- Converters—**  
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- Cranes—**  
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- Grinding Plates—**  
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- Dredging Machinery—**  
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- Dredging Ropes—**  
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- Drills, Air and Hammer—**  
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Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drills—Core—**  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.  
Sullivan Machinery Co.
- Drills—Diamond—**  
Sullivan Machinery Co.  
Northern Canada Supply Co.
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Armstrong, Whitworth of Can., Ltd.
- Drill Steel Sharpeners—**  
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Northern Canada Supply Co.  
Sullivan Machinery Co.
- Drills—Electric—**  
Can. Ingersoll-Rand Co., Ltd.  
Sullivan Machinery Co.
- Drills—High Speed and Carbon—**  
Armstrong, Whitworth of Can., Ltd.  
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- Dynamite—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Ejectors—**  
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- Elevators—**  
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Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
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Can. Fairbanks-Morse Co.  
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Alex. Fleck.  
Sullivan Machinery Co.  
Smart-Turner Machine Co.
- Engines—Haulage—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Can. Ingersoll-Rand Co., Ltd
- Engines—Marine—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
- Engines—Steam—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
M. Beatty & Sons.
- Fans—Ventilating—**  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.
- Feeders—Ore—**  
Fraser & Chalmers of Canada, Limited.
- Flights—**  
Hendrick Mfg. Co.
- Forges—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.
- Forging—**  
M. Beatty & Sons.  
Smart-Turner Machine Co.
- Furnaces—Assay—**  
Lymans, Ltd.
- Fuse—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Gears—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
Hull Iron & Steel Foundries, Ltd.
- Hammer Rock Drills—**  
Mussens, Limited.
- Hangers—Cable—**  
Standard Underground Cable Co. of Canada, Ltd.
- Hand Hoists—**  
Darling Bros., Ltd.  
Fraser & Chalmers of Canada, Limited
- High Speed Steel—**  
Armstrong, Whitworth of Can., Ltd.
- High Speed Steel Twist Drills—**  
Northern Canada Supply Co.  
Armstrong, Whitworth of Can., Ltd.
- Hoists—Air, Electric and Steam—**  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco.  
M. Beatty & Sons.  
Fraser & Chalmers of Canada, Limited  
Northern Canada Supply Co.  
Wettlaufer Bros.
- Hoisting Engines—**  
Can. Fairbanks-Morse Co.  
Mussens, Limited.  
Sullivan Machinery Co.  
Fraser & Chalmers of Canada, Limited  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons.
- Hose—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Ingot Copper—**  
Canada Metal Co., Ltd.
- Insulating Compounds—**  
Standard Underground Cable Co. of Can., Ltd.
- Jacks—**  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Kiln Linings—**  
Hull Iron & Steel Foundries, Ltd.
- Komlnuturs—**  
Hull Iron & Steel Foundries, Ltd.
- Lamps—Safety—**  
Canadian Explosives.
- Link Belt—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Jones & Glassco.
- Locomotives—**  
W. Fraser.
- Machinists and Founders—**  
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- Metal Merchants—**  
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Geo. G. Blackwell, Sons & Co.  
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Canada Metal Co.  
C. L. Constant Co.
- Monel Metal—**  
International Nickel Co.
- Nickel—**  
International Nickel Co.
- Ore Sacks—**  
Northern Canada Supply Co.
- Ore Testing Works**  
Ledoux & Co.  
Can. Laboratories.  
Milton Hersey Co., Ltd.  
Campbell & Deyell.
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Fraser & Chalmers of Canada, Limited  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
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Canada Metal Co., Ltd
- Pig Lead—**  
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- Pipes—**  
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Canada Metal Co., Ltd.  
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Northern Canada Supply Co.  
Smart-Turner Machine Co.
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Northern Canada Supply Co.
- Piston Rock Drills—**  
Mussens, Limited.
- Pneumatic Tools—**  
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Jones & Glassco.
- Prospecting Mills and Machinery—**  
Standard Diamond Drill Co.  
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## Canadian Miners' Buying Directory.—(Continued from page 14.)

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- The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.
- Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.
- Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
- Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.
- Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

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### GEOLOGICAL SURVEY

#### Recent Publications

- Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.
- Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.
- Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.
- Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.
- Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.
- Memoir 85. Road Material Surveys in 1914, by L. Reinecke.
- Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.
- Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.
- Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.
- Memoir 92. Part of the District of Lake St. John, Quebec, by John A. Dresser.
- Memoir 93. The Southern Plains of Alberta, by D. B. Dowling.
- Memoir 94. Ymir Mining Camp, British Columbia, by Charles Wales Drysdale.
- Memoir 95. Onaping Map-Area, by W. H. Collins.
- Map 59A. Wheaton, Yukon Territory.
- Map 60A. Wheaton, Yukon.
- Map 67A. Kirkfield Sheet, Victoria County, Ontario.
- Map 150A. Ponhook Lake Sheet, Nova Scotia.
- Map 175A. Ymir, Kootenay, British Columbia.
- Map 176A. Graham Island, Queen Charlotte Islands, British Columbia.
- Map 177A. Southern Portion of Graham Island, Queen Charlotte Islands, British Columbia.
- Map 180A. Espanola Area, Sudbury District, Ontario.
- Map 184A. Roberval, Lake St. John County, Quebec.
- Map 187A. Southern Plains of Alberta.
- Applicants for publications not listed above should mention the precise area concerning which information is desired.
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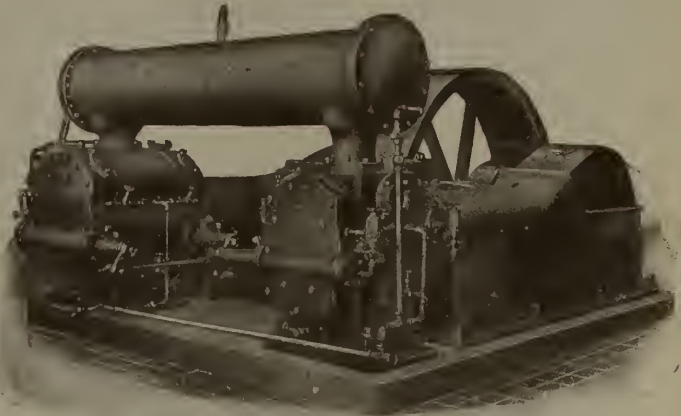
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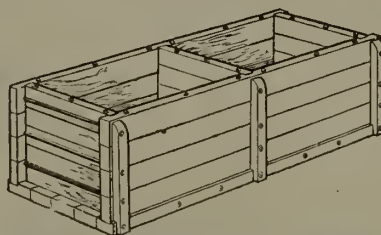
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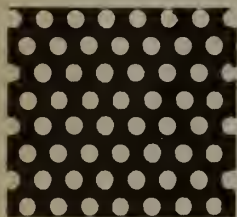
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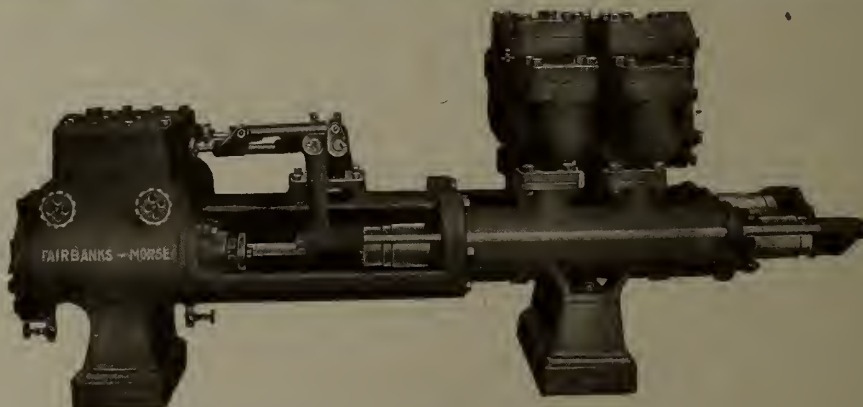
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, June 1st, 1917.

No. 11

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

Head Office . . . . 263-5 Adelaide Street, West, Toronto

Branch Office . . . . . 600 Read Bldg., Montreal

Editor

**REGINALD E. HORE**

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### A REAL MINISTER OF MINES NEEDED.

That committee of Civil Engineers which so completely misrepresented the mining societies of Canada, is recommending to Premier Borden that the Departments of Mines and Inland Revenue be placed under the same Minister. The suggestion is worthy of its authors. They apparently do not know any more about the magnitude of the mining industry of Canada than they do about the number of technical men in the mining societies.

Mining is one of Canada's greatest industries and should be recognized as such by the government. We should have as Minister of Mines a man familiar with the mining industry and he should not be given charge of any other Department. The job requires the whole attention of a properly qualified man, not the half attention of a politician.

Apparently those who have been chosen to govern the country look on the portfolio of Minister of Mines as a sop to be passed around to aspiring members, rather than a position of great responsibility to be carefully administered. How else can one explain the absurd selections that have been made in recent years?

The chief qualifications for the portfolio of Minister of Mines in Canada seem to be political favor and ignorance of mining. It is perhaps recognition of this fact that leads the Civil Engineers to suggest that the Minister of Inland Revenue might as well be also Minister of Mines. Possibly the same reasoning led our brilliant statesmen to combine the portfolio of Mines with that of Secretary of State.

Canada needs a Minister of Mines. We have had enough of the double portfolio nonsense.

The news that the plant of the Kristiansands nickel refining company had been destroyed by fire was received here with mixed feelings. There is regret here for the loss of the plant; but no regret for the cessation of export of nickel from Norway to Germany.

The Norwegian company was not a large producer of refined nickel; but it was under contract to sell a large proportion of its output to Germany. We are not sorry that Germany suffers by the fire.

The process used at Kristiansand is the Hybinette process, which is to be used in Ontario by the British America Nickel Corporation. The construction of a new plant in Norway at this time would therefore be of especial interest here.

Mr. A. A. Cole, President of the Canadian Mining Institute, is in British Columbia seeking the assistance of Westerners in the distribution of the Advisory Council's questionnaire. The Canadian Mining Institute is the organization best qualified to make an intelligent census of mining men in Canada and it is to be hoped that Mr. Cole's trip will result in the hearty co-operation of the Western branch.

## THE STRIKE OF THE UNITED MINE WORKERS OF AMERICA IN THE WEST.

The strike of the U. M. W. of America in the western collieries is a thing to dishearten all patriots. At this distance it is not possible to judge who is to blame, but a condition of affairs which brings about a stoppage of coal production at this time is something which no government should tolerate and with which no decent man should associate himself. The strike is announced as "a pure formality" seeing that the miners have for several weeks been taking a "holiday." If there is anything worse than a lie it is a euphemism of this nature. The action of the Western miners is casting the same disrepute upon Canadian coal miners as did the action of the miners in South Wales, and in New South Wales, upon the miners of Britain and the miners of Australia respectively. The western situation is one that calls for stern and immediate action on the part of the constituted authorities of Canada, and the public should accept no excuse from any of the parties involved for a cessation of coal production at this critical juncture.

There have been ugly rumors from time to time of the effect of German propaganda in bringing about labor troubles in British Columbia and the Canadian West, and certain evidence given in the Franz von Rintelen trial now taking place in the United States does not serve to dissipate the uneasy feeling that certain well-informed quarters possess with reference to the conscious and unconscious connection of the United Mine Workers of America with the subtle propaganda that the Germans carried on to stop the production of munitions in the United States in the earlier years of the war.

Reference was made in this trial to the Rev. Dr. Thomas C. Hall of the Union Theological Seminary, and now of Heidelberg, and his connection with David Lamar, Frank Buchanan and von Rintelen. The evidence states that when Mr. Hall asked Lamar where he thought the propaganda ought to begin he replied "With the United Mine Workers of America," because he had had previous dealings with that organization. Lamar and Martin, one of the men the Government is prosecuting in the case, went to Indianapolis, Ind., where a meeting of the miners' union was being held. Through the intrigues of these men the United Mine Workers were induced to pass certain resolutions calculated to embarrass the manufacture of munitions of war in the United States. There are certain other interesting details showing how the German agents tried to compromise the late Secretary of State, Mr. Bryan, by working on his well-known peace proclivities. Evidently Mr. Samuel Gompers was not deceived by Lamar and his associates, but the United Mine Workers became the tool of German intrigue, probably without fully realizing the fact.

Whether the coal producers in the Canadian West have been beguiled unconsciously along the same pathway cannot be stated with any definiteness; but the result is the same. The miner who strikes today is an ally of the Kaiser, he is acting a disloyal and a traitorous part. He is doing exactly what von Rintelen spent half a million dollars of German secret service money to cause to happen. And worse still, this hampering of Britain's effort, this disloyalty to the thousands and thousands of brave men that went from Canada West to France, is taking place, not in the United States before the republic entered the war on our side, not in the hyphenated centres of the Middle West of which we have heard so much that evidently was not true, but right here in Canada.—F. W. G.

## THE CIVIL ENGINEERS' MEMORANDUM.

Editor Canadian Mining Journal:

Sir,—Your rather startling statement (May 1st), vague as to details, referring to the Canadian Society of Civil Engineers, followed by your further remarks on May 15th, gave me no small concern, and being a member of both the Canadian Mining Institute and the Canadian Society of Civil Engineers, I have taken the trouble to ascertain the facts relating to the memorandum in question.

The memorandum on National Industrial Preparedness was not presented to the Government by the Canadian Society of Civil Engineers, but by four of its members and Sir Charles Ross, almost a year and a half ago. At the annual meeting of the Canadian Society of Civil Engineers the attention of the members was called to this memorandum and the suggestions made therein met with such general approval that it was ordered to be printed and distributed among the members. This was the first official notice taken of this memorandum by the Canadian Society of Civil Engineers, and was accepted in the best of faith as being compiled by men of integrity and responsibility.

Having read the memorandum—not having seen it before you referred to it—I submit that the plan outlined is an excellent one and deserving of commendation. Further, it was published by the Society in appreciation of the plan it contained and without the slightest thought of making comparisons derogatory to any other organization.

It is unfortunate that any comparisons were made in this memorandum and that figures relating to the Canadian Mining Institute were inaccurate and did not do justice to the mining fraternity. As soon as the attention was called of the Council of the Canadian Society of Civil Engineers that the table and the paragraph relating to other organizations were inaccurate, the members responsible for the memorandum were asked to correct any statements therein that were not in accordance with the facts, and it was resolved that all the publicity that had been given to the original memorandum, as far as the responsibility of the Canadian Society of Civil Engineers was concerned, should be given to the corrections to be made.

In this connection, I would suggest that it would greatly interest the mining men if you would publish in full this memorandum in your paper, calling attention to the errors appearing in it.

We want harmony and not discord among the technical men of Canada, and the fact that the secretaries of the Canadian Society of Civil Engineers and the Canadian Mining Institute are today working together in the closest accord in assisting the Honorary Council for Scientific and Industrial Research in distributing and getting in returns from the Research Council's Questionnaire, and are co-operating in an effective manner, shows that there is much to be gained by this meeting on a common ground; and the uniting of forces in this work should augur well for the future relations of these organizations.

Yours, etc.,

R. W. LEONARD.

St. Catharines, Ont., May 26th, 1917.

We are pleased to learn that at last these civil engineers are correcting their statements concerning the technical men of Canada. The memorandum ordered to be published by the Canadian Society of Civil Engineers showed plainly that no effort whatever had been



made to enlist the co-operation of other technical societies. Otherwise the absurd statements concerning the Canadian Mining Institute would not have been made.

As our correspondent points out, the memorandum was not presented to the Premier by the Canadian Society of Civil Engineers, but by four of its members and Sir Charles Ross over a year ago (May 15, 1916). Its inaccurate statements did not therefore get wide publicity until the annual meeting of the Civil Engineers approved of it and ordered it to be printed and distributed.

The letter accompanying the copies distributed is dated April 18, 1917.

The Canadian Society of Civil Engineers in recommending the publication of this memorandum has not merely failed to co-operate with other technical societies, but has made itself responsible for the dissemination of false statements concerning these technical societies.

Mr. Leonard suggests that we publish the memorandum in this journal calling attention to the errors appearing in it. We do not feel qualified to undertake to point out all the errors. We have pointed out some of those that refer to the Canadian Mining Societies. Whether the statements referring to the other technical societies are no more accurate than those referring to mining societies we leave for others to point out. After reading the statements concerning mining men we are naturally suspicious that much of the remainder of the memorandum may also be inaccurate.

While we have pointed out some of the inaccuracies in the memorandum we are ready to agree with Mr. Leonard that it contains many good suggestions worthy of consideration by all technical men. We would be glad to publish the memorandum if it were first carefully revised. Such revision would be made easy if the Canadian Society of Civil Engineers would co-operate with the other technical societies.

## ON THE ORIGIN OF SUDBURY NICKEL DEPOSITS

Editor Canadian Mining Journal:

Sir,—The recently issued Report of the Royal Ontario Nickel Commission is in the main excellent, as would be expected from the ability and high standing of the commissioners, yet a geologist reads one portion of it with some surprise. He finds that all previous students of the geology of the region have been quite wrong in their interpretation of the ore deposits as formed by magmatic segregation, since they are really due to replacement by hot waters.

The gentleman, not a member of the commission, who prepared this part of the report, had already settled this point by studying some polished sections of ore, and so had an advantage over earlier workers, who attacked the interesting problems of the region without any prearranged theory. Knowing the true source of the ores he naturally finds little to commend in former reports, except Robert Bell's description of the sedimentary basin near Sudbury, which seems innocent of any magmatic taint. When T. L. Walker encloses the basin with micropegmatite merging outwards into norite, however, there is a dangerous approach to the doctrine of magmatic segregation, which, of course, vitiates his work. But the worst offenders are Barlow and Coleman, who boldly declare the ore deposits to be magmatic segregations from the norite the latter geologist even stating that the norite-micropegmatite belt is really a sheet underlying the sediments, and that

the ore settled to the lowest points by gravity. A good deal of space is devoted to refuting these heretical views, which are properly condemned whenever mentioned.

For instance, Walker's idea that micropegmatite merges into norite is shown to be quite unorthodox, since the process does not go on as rapidly or as regularly as it ought. Analyses specially made show practically no change in the composition of the norite for half a mile from the edge, so that the magmatic machinery worked badly, if it worked at all, and Walker was unwise to touch the risky subject. Again Barlow and Coleman claim that they have found blebs of ore completely enclosed in fresh norite. This error is demolished by showing that ore occurs also in weathered norite. It should perhaps be mentioned that Walker and Coleman have numerous thin sections which they believe prove their point; but it was not worth while for the writer to cross Queen's Park to see them. Talking over the matter with men who had taken the wrong road could serve no good purpose and might lead to controversy.

The fact that the ore really is found with norite seems a little embarrassing and leads to the suggestion that the norite looks like a dike. Just how this would avoid the difficulty is not shown, and the theory of a norite dike miles in width and enclosing a sedimentary basin, like a serpent biting its own tail, is not elaborated, but the idea is interesting.

The methods employed in refuting the errors of his predecessors are well shown in the account of the famous Creighton mine. Instead of a mass of ore which had settled to the bottom of the norite while liquid we are introduced to a sort of conglomerate or breccia of rock fragments cemented by sulphides brought in by water and occurring between a foot-wall of granite and a hanging wall of norite, but within the granite rather than the norite. The upper edge of the ore-body, instead of passing by gradations into the norite, has a "comparatively abrupt" contact with it; though we are informed a little later that "some of the mineralized norite near the deposit contains from 1½ to 2½ per cent. of nickel and copper combined," and that the spotted norite extends about 2,000 feet beyond the ore.

The explanation given is that hot solutions, coming from a source unknown, have removed the rock and replaced it by the millions of tons of sulphides of the ore-body. And this has all been done so deftly that the rock fragments left are perfectly fresh; no quartz or carbonate has been blunderingly introduced as a gangue; the ores themselves show no banding or crustification; and spots of ore have been neatly planted throughout 2,000 feet of the overlying norite, some of which at least is quite unweathered. Hot water accomplished the work unaided.

This account of things seems so reasonable that no evidence of the methods of replacement by "hot solutions" requires to be given, and the absurdity of the idea that the liquid ore separated from the molten norite and penetrated all the fissures and spaces of the fractured country rock beneath is manifest.

There are prejudiced geologists who still believe that micropegmatite passes downward into the heavier norite; that norite passes into pyrrhotite-norite; that cubic miles of this mixed rock overlie the great marginal deposits; that marginal deposits are always at the lowest points on the floor of country rock and never at upward bends of the contact; and that no ore is found without norite even in the longest offsets.



These features really look like magmatic segregation under the influence of gravity, but they are snares of the evil one. The true believer in the aqueous theory sees through the deception and knows that hot water did it all. One is reminded of the faith which removes mountains.

After the magmatic theory has been so completely discredited in the Sudbury region it is disquieting to find it crop up again a few pages farther on, quite unabashed, where another authority uses it in a modified form to account for the Alexo nickel deposit. There is the definite statement that no replaceable mineral has been attacked and that the ore reached its present position while molten and not by the action of heated waters; so that things happened at Alexo which have been quite discarded by the latest student of the Sudbury ore deposits.

The mining geologist finds much of interest and much to ponder over in the Report of the Royal Ontario Nickel Commission.

Yours, etc.,  
GEOLOGIST.

### THOSE PRODUCTIVE PHOSPHATES.

Editor Canadian Mining Journal:

Sir,—It seems mean to gloat over anyone who is smarting from wounds received in combat, but I cannot refrain from alluding to the answer or quiverfull of answers you got from Mr. White (winner of L.M.) re the discovery of phosphate deposits. I warned you at the time that your attack was ill-judged. Now see what you got! It was more like a shower of quills from a porcupine than anything else. Many a dog has attacked the harmless, if unmolested, porcupine in wanton sportiveness just because he looked slow and stupid and an easy mark, and has regretted it bitterly afterwards. You understand now how the dog feels, and can appreciate Seton-Thompson's famous picture of the porcupine and the dog reproduced below.

Yours etc.,  
OBSERVANT READER.

Editor's note.—Those phosphate deposits seem to have produced a crop of correspondence, if nothing else.



### AN APPRECIATION.

The reproduction, in colors, on the front cover of our March 1st number, of a specimen of gold ore from the Croesus mine has been favorably commented on by many of our readers. The following is from Mr. A. G. Charleton, a past president of the Institution of Mining and Metallurgy:

"I am greatly taken by your artistic frontispiece to the Journal of March 1st. It is the best thing of the kind I have seen, both from the point of view of the mineralogist and artist. It is absolutely truthful and realistic, whilst it is pleasing to the eye."

### THE M. C. M. BATTALION.

Houghton, Mich., May 6.—A battalion of United States engineers, to be known as the Michigan College of Mines Battalion, is the result of an address delivered by Col. J. P. Petermann of Calumet at the banquet of the Alumni Association of the Michigan College of Mines last Saturday night.

After a lapse of one week, President F. W. McNair of the college was enabled to give out yesterday the announcement that the battalion virtually is organized, officered, and manned. The celerity with which this strong and important military unit was brought into existence indicates the patriotic intent of the Copper Country.

The plan of the battalion organization is this:

It will be known as the Michigan College of Mines Battalion of Engineers of Michigan in the National Guard of the United States.

It will be officered by alumni of the Michigan College of Mines, with the exception of present vacancies in the Calumet Company, which will be filled from among the membership of that company.

The Calumet Engineers will be Company A. Companies B and C will be wholly new, with the exception that their non-commissioned officers will for the most part be drawn from the Calumet company in order to facilitate the training and organization of the companies. Students and alumni of the college, practical miners and all eligible young men are asked to fill up the ranks.

The organization will be completed this week, with the companies up to full peace strength at least, and the battalion will be mustered into the service of the state within ten days.

Within a month it is confidently expected the battalion will be equipped and mustered into the service of the United States and in active training at some mobilization camp.

As soon as the preliminary organization is effected non-commissioned officers of the Calumet company will begin drilling the recruits.

Mr. B. W. Vallat will be major.

### PLATINUM.

Most people are apt to think of platinum as pre-eminently adapted to settings for precious stones, but the metal is in fact indispensable to many essential industries. Platinum dishes and utensils are absolutely needed in all chemical laboratories, and upon these laboratories all great industries are dependent for guidance. Alloys have been devised for use in the ignition systems of internal-combustion engines, but no substitute for platinum has been found for certain delicate parts of these systems. Platinum and allied rare metals are widely employed in instruments of precision required for making physical tests of materials of all kinds. Probably platinum is now most valuable for its use in the contact process of making concentrated sulphuric acid, which is essential to a great number of industries that are vitally important at all times, and particularly in time of war.



**MOLYBDENITE DEPOSITS OF ONTARIO.**

By A. L. Parsons.

During the month of May and part of the month of June, 1916, the writer was engaged in an examination of the occurrences of molybdenite in eastern Ontario with a view to ascertaining not only the mode of occurrence but also the possibilities of production of this mineral which is in considerable demand at the present time for the manufacture of high-speed steel. In the present state of the industry it is difficult to accurately judge the possibilities of old prospects or even new ones upon which only a little work has been done, as most of the high-grade molybdenite has been removed from the older prospects and the remaining material has been oxidized and to a large extent washed away, while in the newer prospects it is seldom that fresh molybdenite shows on the surface, and it is necessary to estimate the quantity of rock that has been removed and then estimate the proportion of high-grade ore that has been laid to one side. In either case the results are likely to be fallacious, with the probability of minimizing the quantity of molybdenite present.

In view of the demand for molybdenite for munition work, this preliminary report is submitted before the completion of the work so that those interested in the development of the industry may have a list of the known occurrences to guide them in their search for properties and also that the prospector may have the common association well in mind.

With but few apparent exceptions to the rule, the molybdenite of eastern Ontario is intimately associated with pegmatite dikes in the gneisses and crystalline limestone, probably of Grenville age. In case limestone is present it is usual to find that the pegmatite is not directly in contact with the limestone but is separated from it by a band of pyroxenite which is presumably due to a chemical reaction between the pegmatite and the limestone. Where this pyroxenite is present it usually carries the greater part of the molybdenite and with it considerable quantities of pyrite and pyrrhotite. In certain instances brown and black mica replace part of the pyroxene. When limestone is absent and the pegmatite has intruded gneissic rocks the pyroxenite band is seldom present and the molybdenite is in the normal pegmatite, but in only one case did the writer find an outcrop where no trace of pyroxene was to be seen. In the more normal pegmatite deposits tourmaline is frequently associated with the molybdenite, and in certain instances the pegmatite becomes more siliceous until it appears to be an ordinary quartz vein. The deposits at Net Lake, near Timagami, district of Nipissing, appear to be an exception to the pegmatitic origin of the deposits. At this place the molybdenite is present in a series of gash veins of quartz, which contain in addition small quantities of gold and copper, the latter being in the form of chalcopyrite. Whether these veins are pegmatitic in origin is not definitely known, though such an origin has been suggested for some of the gold veins at Porcupine. In case the pegmatitic origin for this deposit can be shown, the deposits of eastern Ontario may all be grouped together as being associated with pegmatite.

A list of localities where molybdenite has been found in Ontario is given below and brief comments are made concerning the development of some of them.

**Addington County.**

Sheffield Township.—Lot 5, con. XIV. Chisholm

mine. About a dozen men were working in clearing the pits and in regular mining work. The old stock piles were being cobbled and the high-grade ore shipped. The mine is being operated by the International Molybdenum Company, Limited.

Lot . . , con. . . On the farm of Timothy Dwyer is a pit about 8 x 10 feet and 10 feet deep, at which some molybdenite was seen. Not working.

Lot 8, con. XV. On the farm of Matthew Spratt a pit about 10 x 20 feet and more than 10 feet deep was sunk in pegmatite by L. L. Cailloux. The bottom of the pit was filled with water.

Lot 12, con. XII. On the farm of A. Kellar five open cuts have been opened up by O'Briens-Greenfield, of Superior, Wisconsin, and about 160 pounds of pure flake have been taken out in the prospecting. Five men were working at the time of the writer's visit.

Lot 15, con. XVI. Owner, William Wager. Property not visited.

**Victoria County.**

Laxton Township.—Lot 5, con. XI. Two mines are being developed at this place, one on the farm of Wm. Adair by T. Horscroft; the other a few feet away in Mud Turtle lake by Douglas Ponton and A. J. H. Russell. At the time of the writer's visit, Mr. Horscroft was just installing a pump and had done very little work, but the writer was later informed that he had taken out ore which was being shipped to the Mines Branch, Ottawa. Little could be seen of the association, but a small pegmatite dike shows up and a few flakes of molybdenite were found in pyroxenite above water level in the pit which had been opened. The other property, under the management of Captain Russell, was not working on account of the high water which had flooded the shaft. This shaft is about 50 feet deep, and encounters a micaceous pyroxenite containing considerable molybdenite. Several tons of concentrating ore were in a stock pile.

Lutterworth Township.—Lot 7, con. X. On property belonging to A. Y. Hopkins, of Kinmount, a small opening has been made in a small quartz vein in gneiss. Some molybdenite has been found, but probably this vein is not economic. There is, however, a larger mass of pegmatite a few rods to the west which might pay for further prospecting.

**Renfrew County.**

Bagot Township.—Lot 15, con. X. Owner, Samuel Hunter, Calabogie. No work has been done for some years and the deposit does not appear to be economic.

Lot 28, con. XII. On the farm of John Culhane, Ashdod, development work has been done by R. R. Gamey. The molybdenite occurs in a pyroxenite mass adjoining pegmatite. Mr. Culhane informed the writer that about 200 pounds of pure flake had been taken out. There is about half a ton of concentrating ore on the dump. The pit is about 40 feet long by 8 feet wide and averages 4 feet in depth.

Lot 27, con. IV. On the farm of Wm. Warren development work has been done by Mark J. Paterson and Sir Henry Pellatt. The pits were filled with water and the molybdenite-bearing rock was not seen in places. Several tons of low grade ore were seen on the dump.

Lot 25, con. IV. On the farm of Mr. Morin of Springtown. Property not examined.

Brougham Township.—Lots 35 and 36, con. XIV. An open cut about 10 x 70 feet has been excavated by Legree Bros., Dacre, in a micaceous pyroxenite. About 8 tons of ore running possibly 3 per cent. MoS<sub>2</sub>, together with possibly 400 pounds of pure flake, had been

\* From a report published by the Ontario Bureau of Mines.



taken out and laid aside for shipment. The property merits further prospecting, and the ore should be shipped to prevent loss by oxidation.

Lots 76 and 17, con. XI., and lot 17, con. X. Owners of mineral rights, International Molybdenum Company, Limited. Development work is being carried on under the superintendence of J. C. Murray. From 20 to 30 men are employed. The molybdenite is in a series of parallel pegmatite-pyroxenite dikes, and at the time of the writer's visit the work had all been by stripping and open cuts. More than 200 tons of concentrating ore have been shipped from this property. The writer was informed that a shaft was started after his visit.

Lots 7, 8 and 9, con. XI., and lot 8, con. XII. The Renfrew Molybdenum Mines, Limited, under the superintendence of Charles Spearman, are working on a low-grade pyroxenite which lies between Grenville limestone and pegmatite. Several carloads of concentrating ore have been shipped from the property. A drift about 60 feet long and a cross cut about 90 feet in length have been driven into this deposit and two holes have been put in with a core drill. The deposit as exposed is about 600 feet long and 40 feet wide, and apparently offers a large tonnage of concentrating ore. Preparations were in progress for the erection of a mill, and two boilers were being installed. It is proposed to use the Elmore (flotation) concentrator in the mill. Preparations were being made for the sinking of a shaft.

Lot 15, con. XI., known as the Connelly-Chown property. Two pits have been sunk on a couple of narrow pegmatite dikes of apparently the same character as those on the adjoining claims, which are worked by Mr. Murray.

Bromley Township.—Lot 24, con. V. Lessee, J. E. Cole, Renfrew. Development work is being done on a large mass of pyroxenite and about a ton and a half of concentrating ore has been shipped.

Blithfield Township.—Lot 29, con. I. Some development is reported on the farm of Thomas Quilty, but the property was not seen by the writer. He was informed, however, that further development work will be done during the summer.

Griffith Township.—Lots 31 and 32, con. V., and lot 31, con. IV. Owner, W. J. Spain, New York city. Manager, George R. Gray, Dacre. The molybdenite is in two dikes of pegmatite and pyroxenite in gneiss and crystalline limestone separated by about 10 feet of gneiss. The two dikes together give a width of about 25 feet of working ore. The molybdenite occurs in extremely large flakes, some of them being more than a foot across. Masses of nearly pure molybdenite weighing as much as 50 pounds have been taken out. A mill has been erected and was nearly ready for work. As much of the flake molybdenite as possible will be picked out on picking belts, and the remainder, after passing through rolls, will go to a Hooper Pneumatic Concentrator.

Lyndoch Township.—Lots 5 and 6, con. VII. Jamieson mine, operated by the International Molybdenum Company, Limited. Idle at the time of the writer's visit and workings filled with water. There were 57 sacks of low-grade ore ready for shipment and a few small piles of ore to be cobbled. This is looked upon as one of the promising properties.

Matawatchan Township.—Lot 3, con. VI. On the farm of James Wilson one shot has been put in a pyroxenite mass. Mr. Wilson's son told the writer that 2½ pounds of pure molybdenite had been taken out. The rock that had been blasted out appeared to have

run about one-third to one-half per cent., and showed flakes of molybdenite scattered through it. The pyroxenite is on the margin of a large pegmatite mass and is from 40 to 50 feet wide. Nothing definite can be said as to values at present, but there is a possibility of a large tonnage of low-grade material. Further prospecting is desirable.

Miller Township.—Lot 3, con. ... On the farm of Thomas Armstrong a pegmatite dike has been opened up by C. G. Shannon, of Kingston. Some molybdenite was seen, but the property does not appear to be high grade.

Lot 3, con. 8. Property not visited.

Lot 5, Northeast Range. Not visited.

Raglan Township.—Lot 27, con. IX., and lot 27, con. X. Three pits have been sunk on these properties and molybdenite is on two of the dumps. The best pit is on or near the line between the two properties. The dike is about 4 feet wide, and 30 to 40 tons of rock have been removed, and possibly a ton of 3 per cent. ore lies on the dump. The other two pits are on concession IX. John Windle owns the lot in concession X. and H. Liedke the lot on concession IX.

Ross Township.—Lot 22, con. II. Owner, John Rose, Haley. An open cut has been made in a pegmatite dike from 2 to 4 feet wide. The cut is about 50 feet long and from 2 to 8 feet wide. The part showing molybdenite was under water. A ton or so of concentrating ore was on the dump.

Lot 7, con. IX. Property not visited, but the writer was informed that no work had been done for several years.

Sebastopol Township.—Lot 18, con. VII. On the farm of Edward Ziebarth are two small dikes in gneiss and crystalline limestone. Some molybdenite has been found, but further development is necessary to show a sufficient quantity for commercial purposes.

### Haliburton County.

Cardiff Township.—Lot 12, con. XI. Owners of mineral rights, Matthews and McMahon. An opening from which possibly 50 tons of rock has been taken has been made in pegmatite. Some large flake has been taken from this place and a small amount of concentrating ore is on the dump. No estimate could be made as to values.

Lot 11, con. X. On the farm of Alex. Evans a shaft has been sunk and an open cut has been made, but the property has not been worked for some time and the workings are filled with water. A small concentrating plant was erected containing a Wettlaufer crusher, 12-inch rolls and a screen. Several tons of finely pulverized ore containing small flakes of molybdenite were stored in a bin.

Lot 18, con. IX. On the farm of John Mooney is a mass of pegmatite, in which scales of molybdenite are visible. No work has been done on the outcrop.

Lot 6, con. IX. Owner, Walter R. Kidd, Paudash. An open cut has been made upon two parallel pegmatite dikes, each about a foot wide, in gneiss.

Lot 11, con. V. Owner, Walter R. Kidd, Paudash. Two open cuts or pits have been made upon a deposit similar to the last mentioned.

Harcourt Township.—Lot 3, con. I. and II. This is the property formerly worked by S. Dillon Mills and described by him.\* In the main workings little molybdenite was to be seen, but at one of the workings further south a considerable quantity of rich ore had been laid to one side. This ore is a concentrating ore, but the writer would judge that there is from one to two tons of 15 per cent. ore at this place.



**General.**

Other localities which have been mentioned in various reports are noted below, but in most instances the deposits are probably not of economic importance.

Anstruther Township, lots 24 and 25, con. XIV. Beatty Township, lot 4, con. I. Belmont Township, not far from Cordova mines. Big Dneq Lake, north of Schreiber. Black River, Lake Superior region. (Probably the same as Terrace Cove.) Carlow Township. Craigmont, Raglan Township. Digby Township, lot 16, con. VII. Dunnannon Township, lot 25, cons. XIII. and XIV. Visited, but no molybdenite was found.) Foley Township, lots 32 and 33, con. V. Graham Township. Gull Lake, northeast from Dryden. (Not visited. The writer was shown good flakes of molybdenite from this locality several years ago.) Kirkland Lake, district of Timiskaming. Lake of the Woods region. (Several occurrences are known and have been visited by the writer, but with possibly one exception they are not economic.) March Township, lot 6, con. II. (Not visited.) Molybdenite lake near Michipicoten Harbour. Monteagle Township, lots 26 and 27, con. VI. (Visited, but no molybdenite found. It is also reported from lot 6, con. I.) North Crosby Township, lot 14, con. V. Bear's Passage, Rainy Lake. Smooth Rock Lake, Maniton region. (Not economic.) Somerville Township, lot 3, con. A. (Visited. No molybdenite was found. This was the second locality at which molybdenite was discovered in Canada.) Swastika, district of Timiskaming. Talon Chute, about 25 miles east of North Bay. (Dr. T. L. Walker reports that he found graphite but not molybdenite.) Terrace Cove, Lake Superior. (This was the first locality at which molybdenite was discovered in Canada.) Worthington mine, Sudbury district. (Not economic for molybdenite.)

## 25TH ANNUAL REPORT ONTARIO BUREAU OF MINES.

There has just been published the Twenty-fifth Annual Report of the Bureau of Mines, consisting of three parts, being for the calendar year 1915.

Part I. comprises a Statistical Review of the Mining Industry of Ontario for 1915 by W. R. Rogers; a report on the Mining Accidents of the year by T. F. Sutherland, Chief Inspector of Mines, and Inspectors E. A. Collins and James Bartlett; an account of the operating mines in the Province by Mr. Sutherland and Inspectors Collins, McMillan and Bartlett; a description of the Iron Deposits of Hunter Island with notes on the Gunflint Lake Area, by A. L. Parsons of the University of Toronto; notes on Iron Pyrites Deposits in Southeastern Ontario, by P. E. Hopkins; a Study of Certain Minerals from Cobalt, Ontario, by H. V. Ellsworth, of the University of Toronto; reports on Boston Creek Gold Area and the Goodfish Lake Gold Area, by A. G. Burrows and P. E. Hopkins of the Geological staff of the Bureau; and a preliminary report on the Kowkash Gold Area, by P. E. Hopkins. The several illustrated reports of a geological nature are accompanied by appropriate maps and plans, both colored and in black and white.

Part II., entitled Lead and Zinc Deposits in Ontario and in Eastern Canada, by W. L. Uglow, was prepared for the purpose of bringing together all the available information on the subject in view of the

increased demand for these metals occasioned by the war. Dr. Uglow was particularly fitted for this task, having had experience in the investigation of deposits of these metals in the State of Wisconsin. He also made private examination of several properties in Ontario. The mines and prospects are described individually, and the report is accompanied by two geologically colored maps.

Part III., a description of the Geology of Kingston and Vicinity, by Prof. M. B. Baker, of Queen's University, is accompanied by a contoured map, geologically colored, of the southern part of Frontenac county. This part of eastern Ontario is well mineralized, mica and feldspar being mined extensively. The report is accompanied by two appendices by officers of the Geological Survey of Canada Appendix I., the Ordovician Limestones of the Kingston area, by E. M. Kindle; Appendix II., a Synopsis of the Common Fossils of the Kingston area, by A. E. Wilson and K. F. Mather.

In the introductory paragraphs of his statistical review Mr. W. R. Rogers says:

"The Mining Act of Ontario (section 170) requires the owners or operators of all mines, quarries, metallurgical and mineral works in the Province to make returns to the Bureau of Mines, showing the quantity and value of the minerals produced during the year together with such particulars as to number of employees, wages paid, etc., as are necessary for statistical purposes. A penalty is provided for non-compliance with the provisions of the Act, and a further penalty for every day after written notice has been given that the offence continues. Owners and operators are reminded of the importance of supplying complete and accurate information promptly in order that the compilation of statistics for any particular industry may be presented at the earliest possible date in a careful and authoritative manner.

"There are facts regarding the importance of several of the mineral products of the Province, perhaps not widely known in some instances, which are worthy of emphasis. The largest high-grade tale deposit on the continent is situated at Madoc; the greatest mica mine, the Laeey, near Sydenham; the largest high-grade feldspar mine near Verona; and the greatest graphite deposit known as the Black Donald mine, near Calabogie. All these non-metallic deposits are located in eastern Ontario in the counties of Hastings, Frontenac and Renfrew. Coming to the metals, Ontario possesses at Sudbury the most valuable nickel deposits in the world. Of these the Creighton ore body is undoubtedly the largest, the highest grade and most important. Cobalt is widely known as the richest silver camp in the world, the value of the output to date approaching that of gold from the Yukon. Ontario also possesses in Poreupine the most promising of the younger gold camps on the continent. During 1915 in the Province of Ontario there were 79 producing mines, 62 of which operated at a profit."

Much of the information contained in the report just published was given out by the Bureau of Mines some time ago. A preliminary statistical review was published in March, 1916, and most of the articles in the volume were published in bulletin form several months ago. Extracts from several of the special reports have appeared in this journal during the past year. Others will be found elsewhere in this issue.



## WAGE INCREASES AT THE COLLIERIES IN NOVA SCOTIA.

Increases in wages have been gained by the mine workers employed by the Dominion Coal Company, both in Cape Breton and at the Springhill Mines, and by the employees of the Nova Scotia Steel & Coal Company at Sydney Mines.

The Provincial Workmen's Association and the Dominion Coal Company were unable to agree on the amount of the increase in wages that was required to adjust the diminution in the earning capacity of the workmen caused by the increase in the cost of living, and owing to the complicated situation occasioned by friction between the Provincial Workmen's Association and the United Mine Workers of Nova Scotia, the Minister of Labor declined the request of both these organizations, made at separate times, for Boards of Conciliation, and appointed a Royal Commission composed of the Honorable Mr. Justice Chisholm of the Supreme Court of Nova Scotia, Rev. Dr. John Forrest of Dalhousie University, and Mr. John T. Joy, a member of the Workmen's Compensation Board of Nova Scotia.

This Commission, after hearing informally the representations of the workmen with reference to the increased cost of living, and also the representations of the company, gave as its finding the following memorandum of settlement, namely:

1. That ten cents a day be added to the wages of all workmen who are at present receiving wages up to and including \$2.50 per day.
2. That an increase of twelve and one-half per cent. be given to all workmen, including these mentioned in paragraph (1) hereof.
3. That said increase date from the first day of May, 1917.
4. This agreement shall continue in force until the 31st day of December, 1917, and from year to year thereafter, unless any of the parties hereto give notice of its termination two months prior to the expiration of any calendar year.

A resume of the increases in wages given to the workmen of the Dominion Coal Company since the first of June, 1916, may be of interest. At that date an increase of 6 per cent. to all workmen was given, followed in November, 1916, by a further increase of 14 per cent. In addition the Company is paying a "steady work" bonus of 5 per cent. on the earnings of all producers working 22 days out of each working period of 24 days.

At Springhill Mines the Dominion Coal Company have also given an increase in wages effective as in the case of the Glace Bay Mines, from May 1st. An increase of ten cents per day is given to men earning \$2.50 per day and under and in addition an increase of 10 per cent. is given to this and all other classes of mine labor.

The workmen at Springhill are not satisfied with the extent of the increase, and the duties of the Royal Commission were extended to cover a review of the situation at the Springhill Mines also, (and at the time of writing the Commission was in session at Springhill.

Before proceeding to Springhill the Commission investigated the relations between the Nova Scotia Steel & Coal Company and its workmen at Sydney Mines, where an increase of 30 per cent. had been asked by the employees. After hearing the representations of both parties, the Commission gave as its finding the following basis of settlement:

Ordinary laborers, 12½ per cent. increase.

Other classes from \$2.50 and under, 15 per cent. increase, including a number of hoisting engine men.

All classes from \$2.50 to \$3.00, ten per cent. increase.

All classes above \$3.00, 5 per cent. increase.

Hand pick miners, 7½ per cent. increase.

Shooters and loaders, 7½ per cent. increase.

Machine runners, 5 per cent. increase.

To become effective May 7. All bonuses to be put on a flat rate. This award is to continue to 31st December, 1917, and from year to year thereafter until or unless two months' notice by either party before the expiration of any calendar year is given of intention to terminate the agreement.

The Commission devoted a considerable portion of its attention to the relations existing between the Provincial Workmen's Association and the United Mine Workers of Nova Scotia, and it is believed was able to persuade the leaders of the two organizations to agree to the establishment of a new organization intended to absorb the membership of the two existing bodies.

It is thought that the amalgamation recommended by the Commission will take place and that as a result a new union will be formed having an entirely different name, with new officers, and with its activities confined entirely to Nova Scotia under a Provincial charter.

It is yet too soon to say what the result will be, but those who favor amalgamation express much optimism.

## ALIEN ENEMY COMPANIES.

An order-in-Council of May 8th, 1917, is as follows:

"3. No company shall acquire or hold any of the rights, powers or benefits hereinbefore referred to if such company be an alien enemy company, or registered in an alien enemy country, or having its principal place of business within such country, or if the chairman of such company or any of the directors are subjects of an alien enemy country, or if such company is controlled, either directly or indirectly, by an alien enemy or alien enemies, or by an alien enemy corporation or alien enemy corporations.

"4. Any alteration in the memorandum of articles of association, or in the constitution, or in the laws of any company holding any rights, powers or benefits hereinafter referred to shall be reported by the proper officer of the company to the Minister of the Interior, and two months previous notice in writing shall be given to the Minister of the Interior of the intention to make any alteration which might conceivably, either directly or indirectly, affect the character or control of any such company, and if, in the opinion of the Minister of the Interior, the said alteration shall be contrary to the cardinal principal that the said company shall be and remain a company not of alien enemy origin or control, the Minister of the Interior may refuse his consent to such alteration, and if his refusal is not obeyed, may declare such company to be an alien enemy company and may cancel the said rights, powers and benefits under the provisions of the next following regulation.

"5. If any company which has acquired any right, power or benefit hereinbefore referred to shall, at any time, become subject to the control of an alien enemy or alien enemies, or an alien enemy corporation or corporations, or shall assign any of the rights, powers or benefits aforesaid, without the consent in writing of the Minister of the Interior being first had and obtained, or if the said right, power and benefit has been acquired through error, misrepresentation or fraud



the Minister of the Interior may cancel the grant of such right, power or benefit and thereupon the same shall ipso facto be cancelled and any moneys or fees paid to or deposited with His Majesty shall be ipso facto forfeited to His Majesty."

### ONTARIO'S METALLIFEROUS PRODUCTION FOR THE FIRST QUARTER OF 1917.

Returns from metalliferous mines and works of the Province have been collected by the Ontario Bureau of Mines for the three months ending March 31st, 1917. The following table shows quantities and values, also comparative quantities for the corresponding period of 1916. It will be seen that most items show a considerable increase with the notable exception of silver. Explanatory notes are appended.

#### Summary of Metalliferous Production, First Quarter of 1917.

| Product.                                         | Quantity. |           | Value \$. |
|--------------------------------------------------|-----------|-----------|-----------|
|                                                  | 1916.     | 1917.     |           |
| Gold . . . . . oz.                               | 107,818   | 127,692   | 2,601,760 |
| Silver . . . . . oz.                             | 5,297,831 | 3,945,957 | 2,831,873 |
| Cobalt (metallic) .lbs.                          | 36,460    | 84,710    | 78,668    |
| Cobalt oxide . . . . . lbs.                      |           | 83,014    | 66,798    |
| Nickel oxide . . . . . lbs.                      |           | 5,495     | 550       |
| Other cobalt and nickel compounds . . . . . lbs. |           | 118,292   | 13,695    |
| Nickel (metallic) lbs.                           | 11,976    |           |           |
| Nickel in matte . . . . . tons                   | 10,032    | 10,141    | 5,070,410 |
| Copper in matte . . . . . tons                   | 5,491     | 5,063     | 2,025,227 |
| Copper ore . . . . . tons                        |           | 1,507     | 44,097    |
| Iron ore . . . . . tons                          | 6,573     | 52,694    | 94,718    |
| Pig iron . . . . . tons                          | 160,749   | 163,020   | 2,743,441 |
| Molybdenite, concentrates . . . . . lbs.         |           | 25,073    | 32,202    |
| Lead . . . . . lbs.                              |           | 263,046   | 27,290    |

**Gold.**—Despite the scarcity of labor and high cost of operating gold properties, the production of the northern Ontario gold mines has increased by 18 per cent. over the corresponding period of 1916. Of the nine producing mines the Hollinger, Dome and McIntyre output amounted respectively to \$1,315,034, \$528,787 and \$425,408. Other producers in order were Porcupine Crown, Tough-Oakes, Schumacher, Vipond-North Thompson, Croesus and Dome Lake. The Teck-Hughes mill is now in operation, and precipitates are being shipped to the Buffalo mill at Cobalt until the local refinery is completed. All the above mentioned mines are located at Porcupine, with the exception of the Tough-Oakes and Teck-Hughes at Kirkland Lake, and the Croesus in Munro Township. In addition to gold, 20,465 oz. of silver, worth \$15,321, were recovered from auriferous ores.

**Silver.**—A considerable decline in production is evidenced in the figures presented for the quarter as compared with the first three months of 1916. Deducting silver recovered from gold and copper ores, the total production from Cobalt and Gowganda amounted to 3,924,849 oz. valued at \$2,815,091. Twenty mines contributed to this total. Those shipping one quarter million oz. or over are named in order: Townsite-City, Kerr Lake, O'Brien, La Rose and Coniagas. Production of bullion by the Nipissing mine exceeded shipments by 636,182 oz. valued at \$481,438. As this company usually ships to London, no doubt the increase

in ocean insurance rates has deterred marketing the entire product. Flotation methods are now in use at several of the mines for recovering silver from tailings dumps. For example, at the Buffalo, 5,444 tons of ore and 21,379 tons of tailings were concentrated. The average New York price of silver for the quarter was 75.69 cents, low 71.75 and high 78.64 cents per fine oz.

**Refineries.**—At Deloro, Thorold and Welland the refineries treated 1,109 tons of ore and 341 tons of residues from the silver camps. A total of 1,676,617 oz. of silver worth \$1,045,246 was recovered. In addition, 847,101 lbs. of cobalt metal was marketed, 25,998 lbs. of which was in the form of stellite, a high speed tool "steel" much used in munition work. Cobalt and nickel in the form of oxides and other compounds add to the total output of the refineries.

**Nickel-Copper.**—Smelters at Copper Cliff and Coniston continue operating at the same high rate as last year. For the quarter year 18,995 tons of nickel-copper matte were produced as compared with 80,010 tons for the year 1916. Ore smelted for the period was 358,961 tons. As a basis of valuation nickel and copper in the matte have been placed at 25 and 20 cents respectively, or the same price as in 1916 for nickel but an advance of 1½ cents per pound for copper. Construction of the new refinery of the International Nickel Company at Port Colborne is proceeding.

**Copper.**—The prevailing high prices obtaining have stimulated copper mining, despite labor scarcity and high operating costs. A new shipper of chalcocite is the Hudson Copper Company at Havilah, near Bruce Mines, Algoma district. The main shipper was S. W. Ray, who is operating the Tip Top mine at Kashabowie, west of Port Arthur. At Mine Centre, Rainy River district, a concentrator is being built by the Connell-Hewitson interests. In the meantime shipments to Trail smelter have ceased. The concentrating mill and flotation plant of the Kenyon Copper Mines at Massey is being overhauled and shipments will be made in the near future.

**Iron Ore and Pig Iron.**—Iron ore from the Helen and Magpie mines which are operated by the Algoma Steel Corporation, was shipped to Ontario blast furnaces. No iron ore was exported. The Algoma Steel Corporation, Canadian Furnace Co. and Steel Company of Canada smelted 60,838 tons of Ontario ore and 256,385 tons of foreign ore producing 163,020 tons of pig iron, of which 118,503 tons were used in steel making. Good progress is being made by Imperial Forgings, Limited, on the new electric steel and forging plant located in the Toronto harbor industrial area. It is expected to be ready for operation in July.

**Molybdenite.**—The production for the quarter is greatly in excess of that for the entire year 1916. Concentrators treating Ontario ore are operated by the Renfrew Molybdenum Mines Ltd., at Mount St. Patrick; the International Molybdenum Co. at Renfrew, and the Mines Branch, Ottawa. In addition, refineries in operation at Belleville and Orillia produced 41,967 lbs. of ferro-molybdenum valued at \$98,513.

**Lead.**—The entire production came from Galetta, Carleton County, where the James Robertson Estate is operating both mine and smelter. A shipment was made from the Frontenac mine by the Indian Lake Lead Mining Co. to the Kingston Smelting Company, but was not treated.



### AGREEMENT REACHED AT ROSSLAND, B.C.

Full details of the results of the negotiations between the committee of five delegated by the Rossland miners who had been employed in the mines in that camp of the Consolidated Mining and Smelting Company, and officials of the company have been published.

In its report to the miners, after having been in negotiation with company officials, the committee said, in part: Owing to the unsettled state of the coal-mining industry, which condition has cut off the supply of coke for the smelting of the Rossland ores, it was found that any further work to be carried on by the Consolidated Mining and Smelting Company at this time must be development work. Your committee suggested to the officials of the company that, in their opinion, if at all possible, such work should be undertaken, so that the men who had already been out of employment five weeks could resume work, if only for a month or so. This the officials of the company agreed to do, the understanding being that as soon as the head-frame at the company's Centre Star mine is repaired, men will be put to work underground in the company's Centre Star, Le Roi, and White Bear mines, the company agreeing to start the work as rapidly as possible, until a maximum of approximately thirty machine drills shall have been started.

It was pointed out by the officials of the company, and agreed to by your committee, that the cost of this work should exceed the usual cost of such work when carried on under more favorable conditions, that is the cost of development work while operating at full capacity. The company's officials believe that much can be accomplished toward lowering this extra expense providing all men co-operate in reducing wastage to a minimum. This suggestion on the part of the company your committee believes to be fair, and we would suggest that all our members use their influence to make this development cost as little above the usual cost as possible.

While this work is being carried on the increase will be the War bonus of twenty-five cents per man per day, as set forth in the company's letter dated March 12th, 1917.

When the conditions in the Crow's Nest Pass again become normal and the company shall resume shipment of ore from the Rossland mines to the extent of 750 tons a day, there will be an increase of fifteen cents per man per day over and above the War bonus, this further increase to extend over a period of time of approximately two years.

In the opinion of your committee this arrangement is fair, and we would recommend that it be ratified by the members of the Union as a complete settlement of all matters under dispute.

### Company's Proposals Accepted.

It was announced that the result of the miners' vote on the proposals of the company to the men was that they were almost unanimously accepted. The Rossland Miner, commenting editorially, said:

The men employed in the mines here, and the Consolidated Mining and Smelting Company, have reached an agreement in respect of the differences—if differences they can be called—that have existed between them, and it is now quite likely the situation will be cleared completely here if the Crow's Nest coal section employees and the coal-mine operators can reach an understanding; or, should the Dominion Government

answer the appeal of both the coal companies and some of the men and take charge of and operate the mines.

Upon the settlement of the Crow's Nest troubles depends solely, it would appear from the letter of Mr. J. J. Warren, managing director of the Consolidated Company, a complete resumption of operations in Rossland mines, but in the meantime the company has signified its willingness to care for the workmen remaining here through development work, although this, it is stated by those who know, will entail a greater expense than if the work were done with the property on a full working basis.

The company appeals to the men to co-operate with them in performing this work, while the coke conditions remain as at present, as economically as is possible, through preventing wastage, and in turn the committee representing the workmen make a similar appeal to the men, which indicates that both interests are willing to work to the end that the concessions made to the men may be effective and probably lasting until such time as better conditions shall prevail.

When such differences arise between the laborer and employer it is always a case of give and take, and the letter of the committee read at the meeting of the Miner's Union shows that the members of that committee pursued their duties diligently and worked untiringly to bring about a resumption of work by agreeing with the company, which is at present having other troubles through the shortage of coke affecting the big smelting plant at Trail, and by recommending the company's proposals be accepted.

It would appear from the understanding arrived at between the company and the men that, when all obstacles shall be removed—and it is sincerely hoped that this will occur soon—a complete resumption of work will take place in the company's mines in Rossland camp. May the trouble elsewhere clear at once. This is the hope of everyone resident in this region.

### WHO AM I?

I am more talked of than anything else in America!  
I am the autocrat of the commercial interests!  
I control the treasuries of the world!  
I command the bank clearances!  
I am as powerful as Ajax!  
I can stop commerce!  
I am supreme!  
Rulers and the common people alike  
Take off their hats to me.  
My aristocratic cousins, the luxurious Pullman car,  
And the steel coach who in the past snubbed  
Me, now crave my favors!  
I am mercurial!  
I can help you, but  
I lack energy!  
You must supply that!  
Left to my own efforts  
I am inert and innocuous!  
Energize me and you increase your bank account!  
Stimulate me and the wheels of commerce revolve!

### Who Am I?

I am the freight car!  
I market your crops!  
Load me promptly!  
Unload me quickly!  
Move me swiftly, and  
You will prosper!

—St. Louis Furniture News.



**COAL WASTAGE.\***

By Francis S. Peabody,

Waste of the wonderful store of power that the Creator placed at our disposal appears to have been the theory and the basis of our methods of extracting this power—waste from the time the coal is mined to the time it is consumed. Let us consider the prime causes of this wastage which has been the heritage of the coal mining industry.

In the early days—about 150 years after “Stone Cole” was discovered in Illinois by Joliet and Marquette, and Father Hennepin noted a “cole” mine on his map—the mode of mining prevalent among farmer land-owners, on whose property coal was discovered near the surface or out-cropping on the hillsides, was to enter the seam by a shallow shaft or drift into the hillside and remove the coal by wedging it down until a large room was left. The roof without support would fall and our primitive coal operator would then sink another shaft or drive another drift. In these early operations only the large lumps were taken and all small pieces and screenings were left to be covered by the fall of the roof—in fact this condition prevailed in Illinois up to about 1885.

Gradually the method of mining changed from the open chamber, to a single entry with rooms turned to the right and left. Later, as the demand for coal increased and the necessity for larger mines became evident the “room and pillar” system grew to be regular practice.

The room and pillar system of mining consisted of starting away from the shaft bottom or drift mouth, with a pair of entries usually 12 to 15 ft. wide and about 30 ft. center to center, one entry being used for the air intake and the other for the return air and haulage; from each entry rooms or chambers were turned, narrow at the mouth and widening to between 20 and 30 ft., these rooms being driven to a depth of about 200 ft. from the neck or mouth.

Practically all present-day methods and systems of mining bituminous coal in the United States, except “longwall,” are based on this system and it is surprising to note how little improvement has been made over the old method even in what is considered the most approved system of today, the “panel” system.

Using the panel system the operator starts away from the shaft or drift mouth with a pair, or sometimes three entries; but instead of turning rooms off the main entries, “stub” or “panel” entries are turned. These panel entries are driven between 1,000 and 1,200 ft., and from them are turned rooms as the entries advance.

As we study the old laborious methods of our fathers and compare them with present-day practice, we realize we have not improved coal mining methods at a pace equivalent with other industries. True, we have machines for mining and modern high-speed hoists at our mines producing 5,000 or 6,000 tons of coal per day, but our percentage of recovery is little, if any higher, than in early practice.

With all credit to present-day coal operators let me remark that most, if not all, mines are started with the view of recovering the chain pillar coal, at least, on the second mining, or as the mine retreats after having reached its boundaries and just prior to abandonment. I am afraid, however, it is mostly a case of “the spirit is willing but the flesh is weak,” for I know of only one mine about to be abandoned which worked for nearly two years before abandonment recovering pillar

coal and recovered approximately 350,000 tons out of possibly 4,000,000 tons left in the ground.

Another, and the most deplorable condition created by present haphazard methods, is the dangers to life and limb. Our miners produce a great many more tons of coal per year per man employed than they do abroad, because we have less supervisors, and therefore naturally there are less men employed per ton produced.

The coal industry is beset by all manner of waste, waste of natural resources, waste of the human element and waste of capital, and we do not seem to realize how dearly future generations must pay for it.

It would be far better if a situation could be created in the near future with strong governmental control, so that the bituminous coal industry could be thoroughly regulated with respect to the operation of present properties, so that all may operate on a reasonable basis, returning a fair percentage of recovery, with regulations that will insure the best conditions for the safety of life and limb, and so founded that the operator will be assured of a reasonable return on his capital invested.

Such regulation of the coal industry when it does come must begin at the bottom. The industry must be regulated from every standpoint. The governing commission must be assured that the prospective operator owns, or controls, sufficient coal land to permit a mine large enough to produce a sufficient tonnage to return the investment in the surface plant and non-movable machinery, etc.—in other words, to wipe out the capital accounts.

A system of mining whereby all, or at least 97 per cent., of the coal in the ground must be recovered, would have to be provided and rigidly enforced; a system providing for the protection of the now valueless thinner seams of coal and also for the protection of the other minerals, sandstones, shales and other rocks, which are now of no conceivable value, but may in future years be discovered to be a very important factor in some industry yet undeveloped.

All this regulation would necessarily involve much time and study and would gradually be revised as new conditions were met. Objections would be raised; attempts would be made to prove the early acts unconstitutional; claims would be made, that only those controlling large amounts of capital could enter the business.

Let me say that the coal business is not a business for small capital. That is one of its greatest difficulties today. If we want a charter for a coal company now, we can get several dummy directors and pay a lawyer \$50 or \$100 and secure a charter for a full-fledged coal company, with the rights to sink shafts and produce coal, and incidentally waste 45 to 50 per cent. of the natural resources in the ground.

In Germany, where wages are much lower than in this country and where machinery is less expensive, the investment in the coal business per ton of the annual production, not including any sums spent for mineral rights, for the government owns it all, is \$2.50. It is a law, in this war-besieged country, that all the coal must be mined. In the States of Illinois and Indiana the investment per ton of the annual production is about \$1.46 and we are mining only practically half of the coal in the ground. When we consider the greater money value in Germany, it is apparent that coal mining in Germany is limited to those who are able to do business in a large way and with business-like methods.

\*Extracts from a paper to be presented at the St. Louis Meeting, A. I. M. E. October, 1917



I do not know of, nor would I attempt to specify any particular system whereby all the coal can be recovered, but I do know that if the "retreating" system or something similar to it were adopted and so regulated that all coal operators must meet this standard, it would be a very desirable advance over our present methods.

In the retreating system, as it is talked of among coal men, main entries are driven to the boundaries of the coal property after which stub or panel entries are driven. The main body of the coal is extracted as the mine retreats to the shaft. To do this it is necessary that the mine be sunk and worked for a number of years, probably averaging between 10 and 15, at a loss.

The surface plant would be fully equipped at a cost of approximately \$300,000 taking the average mine of today as a standard. The coal rights, either owned or leased would necessitate a carrying charge of say \$25,000 to \$30,000 per year, until the boundary is reached by the main entries the output would be small, probably no more than 200 tons per day in the first year and about 1,500 tons per day the year the boundary is reached. From then on the tonnage would rapidly increase and the mine be on a paying basis immediately.

Every ton of coal taken from the entries would undoubtedly cost the operator not less than \$2.50 to \$3 per ton to produce and would probably sell, judging from present market conditions, for \$1.50 per ton, leaving a deficit of \$1 to \$1.50 per ton produced, to be charged to the capital account. I do not wish to infer that our present entry coal costs this much to produce, but with the system outlined it would also be a part of the proposed scheme of things that all supports, such as we now call "timbering" would be of a permanent and possibly a recoverable nature. Our mine tracks would be laid of far heavier steel than used at present and all items of operation would be of a far more permanent nature than is now required.

Assuming we opened a mine according to this ideal standard, carried it through for a number of years until the entries reached the limit, all work done being of a permanent nature, with the losses on production capitalized up to the time when production reached a stage sufficient to put the mine on a paying basis, our investment, according to my general figures, would amount to \$500,000. Our mines naturally being fewer in number than at present our operations would be steady and our ideal mine would produce possibly 2,000,000 tons of coal per year. Then taking into consideration our sinking fund for all causes, we would have to be guaranteed not less than 20c. per ton net profit to realize an equitable return on our investment. In Germany, where regulations similar to those I speak of are in effect, persons entering the coal business must show unquestionable evidence that they are able financially to stand the enormous investment called for.

It is not unreasonable to assume the investing public and the capital interests would not bear the same ill feelings toward the coal industry they now do, if they could be assured the business was so regulated that the possibilities of loss were minimized. It would not be any more difficult to call upon them for large sums to be invested in operating property than it is at present to secure capital for investment in coal lands.

I venture to say that many operators in the business today, if compelled to keep their costs in a standard commercial manner, charging just and fair depreciation on their coal lands and their plants, would find that they are not making any profit. I maintain that it would not be against the interests of the public to exact a profit, for we would be saving the natural re-

sources for the years to come, which, under our present method of extravagance, will be so minimized in the future that five and six times the profit I mentioned will be regarded as just.

The consumers will lose in the long run if the mine operators do not make a fair profit or the miners do not receive a fair wage; therefore, in the opinion of the English Privy Council, the mere intention of an agreement to raise prices does not always prove the intention to injure the public. To prove an intention to injure the public by raising the prices, the intention to charge excessive or unreasonable prices must be apparent. I, therefore, believe it is to the best interests to all, not only those in the coal industry, but also those who have dealings with the coal industry to advocate strongly the enactment of a law providing for combinations and agreements of the kind which will permit producers of natural resources to produce and market their products under a uniform cost-accounting system, and a uniformly regulated manner of production, safeguarding the natural resources of the earth from wanton waste, and returning to the men in the industry a return which is commensurate to the value of their services to society. When I say the men in the industry I mean the men who work with their hands, the men who are charged with the executive management, and the men who furnish the necessary capital and credit.

#### PERSONAL AND GENERAL.

Mr. Ben W. Vallat, formerly superintendent of the Newport iron mine, Michigan, is to be major of the Michigan College of Mines engineering battalion. Mr. Vallat is president of the Dominion Forge and Stamping Co., Walkerville, Ont. Other officers of the battalion will be: Ira G. Penberthy, engineer for the Calumet & Hecla Mining Co.; W. F. Lewis, of Ewen, Mich.; Harold M. Schmidt, of Calumet; Carl G. Smith, of Mohawk; Eynon S. White, W. H. Clark, H. L. Parrish and S. H. Lorain.

Mr. H. K. Boysen, formerly on the staff of the Tough-Oakes mine, is a cadet in the Royal Flying Corps and is now at Camp Borden, Ontario.

Mr. H. W. Whittingham, formerly of the Nipissing mine staff, is a captain in the 71st heavy artillery, B. E. F.

Mr. A. J. Tonge has been elected, by acclamation, second Vice-President of the Mining Society of Nova Scotia. His name was omitted in the account of the annual meeting published in our May 1st number.

Mr. A. A. Cole, president of the Canadian Mining Institute, is in British Columbia. He attended the meeting of the western branch at Nelson, May 19th.

Mr. H. G. Young has been granted a commission in the Canadian Engineers, tunnelling division, and is now at St. John's, Quebec, training depot.

Mr. J. S. DeLury has left Winnipeg on a trip to the Rice Lake district.

Mr. H. G. Young, formerly manager of the Hudson Bay Mines, Ltd., also of the Trethewey Silver Cobalt Mines, Ltd., at Cobalt, Ont., has returned to the east from Alaska and is stopping at the Windsor Hotel, Montreal. Mr. Young has been engaged in gold mining near Juneau, Alaska, during the last three years for the Algonican Development Co., Ltd., a Belgian company.

Mr. Clyde Weed, manager of the Lake Mine, has been appointed manager of the Hancock copper mine, Michigan, succeeding John L. Harris.



**MINERALS SEPARATION WINS SUIT.**

Philadelphia, May 26.—United States Circuit Court of Appeals late yesterday afternoon rendered a decision in favor of the Minerals Separation Co., Limited, against the Miami Copper Co. The case involved use of certain patented processes in the separation of copper from ore. The majority opinion was written by Judge Woolley, and concurred in by Judge McPherson, a dissenting opinion being rendered by Judge Buffington. It was generally believed by those in court when the decision was handed down that the case would again be appealed, the suit involving matters of such tremendous importance to the mining industry.

Philadelphia.—Majority decision in favor of the Minerals Separation, Limited, of Great Britain against the Miami Copper Co. in the United States Circuit Court of Appeals here hinged upon the priority of the patent rights involved.

Judges Woolley and McPherson ruled that the defendant in employing slight variations of the Minerals company patents merely adopted a subterfuge and that "in our opinion the patent discloses invention and has not been anticipated."

Judge Buffington, in writing his dissenting opinion, holds that:

"Putting aside all minor incidents, the case in my judgment involves one broad, basic and far-reaching question, and that is whether any and all advance and improvement in the sphere of air flotation in mineral recovery for the next few years shall be subject to what will practically be a blanket claim for any use of air as a flotation agent."

The opinion is probably one of the most technical, complete, and consequently voluminous, handed down by any court in years. The jurists discuss in technical detail about every phase of the various separation processes, and state their opinions upon the bearing which the practices employed by the defendants, such as use of an oil of slightly different specific gravity than that specified in the patent rights of the patentees, or the slightly different manner in applying air in the course of the flotation process, have upon the legal rights of the patentee.

Upon this point the majority of the court says: "The question simply is whether certain practices come within scope of the patent claims. But the question of infringement has grown far beyond the borders of the case, and we are really asked, both by the plaintiff and by the defendant, to determine the scope of the patent in such terms as will inform the art as well as the owners of the patent of the precise field covered by the patent and the extent of the field left free to the art." \* \* \*

"We are aware that this very brief statement is technically inadequate and will be understood only by those who are familiar with the history and development of the art of ore concentration." \* \* \* "We do not find it necessary to discuss the question of validity; our conclusion is that the patent discloses invention and has not been anticipated."

"As in the case of the oil process, the patentees seem to have taken the final step which converted experiment into solution, turned failure into success, and we find nothing in the prior art which can be held to anticipate it."

The suit was brought for damages and to secure an injunction against Miami Copper Co., capitalized at \$4,000,000, and which in 1916 was producing copper ore from its properties in Gila county, Arizona, at the rate of 50,000,000 pounds annually and that at an average cost of eight and a half cents per pound.

Judge Buffington, in weighing effect of the court's decision upon the industry, says: "To my mind this claim should not be awarded in this sweeping scope, which will paralyze the subsequent development of a great art."

**STANDARD SILVER-LEAD MINING CO.**

**Income Last Year Exceeded Nine Hundred Thousand Dollars.**

Surplus of Standard Silver-Lead Mining Co., Silverton, B.C., was \$296,726 on March 31, according to report submitted at annual meeting in Spokane on Tuesday, May 8. Net profits for the month were \$43,918, as compared with \$71,690 in February and \$53,811 in January, while gross receipts were \$100,194, as against \$118,855 in February and \$99,109 in January. Settlements for the period were \$16,768 for 116 tons of lead ore and concentrates shipped; zinc sales were \$74,641, and boarding house and miscellaneous receipts were \$8,785. Operating expense was \$35,787.

Report of operations for 1916 showed a total income of \$934,312, of which \$664,267 was derived from preliminary settlements on 5,284 tons of lead ore and concentrates shipped, \$207,521 from zinc sales, \$58,864 from boarding house and \$3,660 from umpires. From this was deducted \$28,600 for zinc penalties on lead shipments and corrections for final settlements, leaving \$905,712. Disbursements for the period were \$517,348, distributed as follows: Ore production, \$252,755; tramming, \$9,711; milling, \$42,284; power, \$7,052; general expenses, \$11,748; shipping and selling, \$10,416; salaries, \$3,600; boarding house, \$51,357; taxes, \$15,873; insurance, \$1,959; casualty insurance, \$6,132; development, \$43,070; construction, \$92,129; Aylard tunnel, \$22,645; No. 7 tunnel, \$2,602; store supplies, \$1,961; experiments, \$339 and home office account, \$21,712.

Net profits for the year were \$388,364, as against \$510,430 in 1915, and the surplus carried over from the previous year was \$336,943. Dividend payments in 1916 amounted to \$600,000, or 30 cents a share on issued capitalization of 2,000,000 dollar shares, leaving surplus on January 1, 1917, \$125,307.

Former officers and directors were re-elected at the meeting. W. J. C. Wakefield is president, John F. Clark, vice-president; George H. Aylard, managing director, and Charles Hnssey, secretary-treasurer. Henry White, Wallace, Idaho, completes the directorate.

**THE BUSINESS PROFITS TAX.**

Ottawa, May 22.—The business profits tax imposed by the Dominion Government on earnings in excess of seven per cent. will not be renewed after the end of the three-year period provided in the original legislation. An intimation to that effect was given to the Commons last evening by Sir Thomas White.

The Minister of Finance, in replying to a question by E. M. Maedonald, of Pictou, during the consideration in committee of the resolution providing for increased profits taxes, stated that by 1918, when the Government would receive the taxes for accounting periods ending in 1917, the war should be nearly finished. The excess profits tax, he explained, was necessary and fair during war time, but it was not a tax that should be continued into peace times since it operated to prevent a flow of capital into the country. Limited as it was to war time it did no damage in this direction since the business world rightly regarded it as a war measure only.





## AT THE PAS.

The Pas, Man. May 18.—A 60-foot barge has just been launched at the Ross Navigation Company's dock. It is one of a number to be used for the conveying of ore from the Mandy mine now on the dump at Sturgeon lake portage.

The work of constructing the stern wheel passenger steamer of the Ross Nav. Co. is going ahead. It will ply between the mines northwest and The Pas.

Messrs. G. Garwood and Lindsay Parks are outfitting at The Pas for a prospecting tour through the Athapapuskow, Amisk and Herb lakes regions. Mr. Garwood has spent some years in Alaska and British Columbia, while Mr. Parks is a former student under Professors DeLury and Wallace.

Mining Engineer in charge of the Rex mine, Walter Neal, has arrived from the south, and immediately departed for Herb lake. He is most optimistic concerning the prospects of the Rex, which he is now developing. He states that he has ordered a compressor, and has

J. MacMartin was a visitor to the Herb Lake mine region the past week, and was well pleased with what he saw.

A copy of the statement of results from the first car of ore shipped by the Northern Manitoba mine of Herb lake:—

Trail, B. C., April 24, 1917.

Consolidated Mining & Smelting Co.

Contents of car 20164:

|                                                |            |
|------------------------------------------------|------------|
| 114,572 ounces gold (\$20) at 95 per cent..... | \$2,175 86 |
| 31.67 ounces silver .....                      | 22 15      |
|                                                | <hr/>      |
|                                                | \$2,199 01 |
| Less treatment.....                            | 86 36      |
|                                                | <hr/>      |
|                                                | \$2,112 65 |
| Less freight.....                              | 299 02     |
|                                                | <hr/>      |
|                                                | \$1,813 63 |



Sketch Map Showing Routes to The Pas.

authority from his company to immediately put in a mill of 15 stamps capacity.

Robert Kerr has just returned from a trip to the Northern Manitoba property, at Herb lake. He reports that all the machinery and supplies are now on the ground, and that everything should be in shape to start drills going by June 1st.

Hackett and Campbell are turning up some very rich ore off the Bingo vein.

Tom Rivers staked a small island on the lake which has a vein showing free gold. So Tom now takes rank amongst the many "millionaires" at Herb Lake.

It is the intention of the company to ship five more cars of ore as soon as circumstances will permit.

A number of mining men and others connected with mining affairs took train Monday for Saskatoon, where they will give evidence in the court case of Reynolds vs. Jackson. The former claims an interest in the find that has now developed into the Mandy mine. Amongst those departing for the southwestern city were: R. A. Hazelwood, J. P. Gordon, C. M. Teasdale, D.L.S., A. P. Seymour, J. R. Campbell, W. J. Young, H. C. Carlisle, S. S. Reynolds and Paul.—The Pas Herald.



## OBITUARY.

## H. S. Poole.

The following obituary is copied from the Halifax Chronicle, and will doubtless be of melancholy interest to the mining profession in Canada. In the passing of Dr. H. S. Poole, Nova Scotia loses, as the Chronicle remarks, one of her most prominent scientific men, and one who was closely associated with the beginnings of the great development of coal mining in Nova Scotia that dates from the early seventies.

A perusal of the Transactions of the Nova Scotia Institute of Science gives rise to many reflections on the changes that have taken place in the past fifty years, and one cannot but feel that notwithstanding the enormous development of the mining industry, and the great increases in output and capitalization that have taken place, we have lost something of the taste for scientific investigation, flavored perhaps to our modern minds with a suspicion of dilettantism, that was characteristic of the more leisured times of our immediate forerunners. There was a great galaxy of scientific men in Nova Scotia when Dr. Poole was a young man, and nowhere can one gain a better idea of the different atmosphere of those days than by reading the Transactions of the Nova Scotia Institute of Science. We find Dr. Poole's writings intermixed with papers from such men as Mr. R. H. Brown, the author of the classic account of early coal-mining in Cape Breton, from the younger Haliburton, the Rev. Dr. Honeyman, Edwin Gilpin, with recent reminiscences of Sir Charles Lyell, Sir J. W. Dawson and Sir W. W. Logan.

Dr. Poole, when manager of the Caledonia Colliery, could find time to record and leave for future readers interesting information of the meteorological conditions, of the appearance and disappearance of the drift-ice, and the migratory birds along the sea-coast. He was attracted by speculative geology, and left behind him disquisitions on such subjects as the possibility of coal under Prince Edward Island, and a short contribution to the Transactions of the Royal Society of Canada on "A submerged tributary of the great pre-glacial river of the Gulf of St. Lawrence," in which he deduced from the soundings of the Gulf the probable course of that most ancient waterway, the St. Lawrence River, when Prince Edward Island and the Nova Scotia mainland were joined by dry land.

Dr. Poole's most serious contribution to Canadian geology was his report of 1893 and his later and revised report of 1904 on the Pictou coalfield, and no student of geology could wish to investigate a more complicated geological puzzle than this extraordinary coal deposit.

Dr. Poole, it is believed, was the only Fellow of the Royal School of Mines connected intimately with coal-mining in Nova Scotia, and his professional record, as may be gathered from the following account, has well supported the reputation of that notable school of mining.

Dr. Poole's death severs one of the few remaining links with the early history of coal-mining in the Province of Nova Scotia, and with his passing there comes a sense of real loss to the profession, and particularly to the Nova Scotia Mining Society, of which he was a long and honored member.

There is also another sense of loss in reading of the death of one who belonged to the "old school" of men who were able to combine scientific pursuits with active participation in industrial activities. Scientific enquiry and pure research are now largely left to college professors, or to the members of government de-

partments, such as the Geological Survey, and there has taken place a more or less complete divorce between the captains of industry and the ranks of the scientists. Several technical societies in Canada are now deploring the absence from their membership and their meetings of college professors, and scientific men of eminence. There are one or two outstanding instances of men in Canada who have worthily maintained the traditions of an older and less strenuous school, but such men are becoming less in numbers. The loss is mutual. The simon-pure scientist and professor sometimes becomes a rather terrible person, as we have had occasion to observe them in German circles, and, on the other hand, the man of business and nothing else is a person whose defects do not require enumeration to be remembered.—F. W. G.

"Henry Skeffington Poole was born at Stellarton, N.S., in 1844. He was educated at King's College, Windsor, receiving the degree of B.A. in 1865; M.A. in 1874, and D.Sc. in 1903. He received his professional education at the Royal School of Mines, London, of which he was an associate and fellow.

"Returning to Nova Scotia, Dr. Poole practised his profession at the Coal Mines, Cape Breton, and then at the silver-lead mines, Utah. He was Inspector of Coal Mines, Nova Scotia, from 1872 to 1878, and subsequently chairman board of examiners for mining certificates, and general manager of the Acadia Coal Company. During this management, he resided at Stellarton, and many will remember the hospitality of his home at "Birch Hill," Stellarton.

"When he retired from active work and moved from Stellarton to Halifax in 1901, he was presented with a silver service by the directors of the company.

"Dr. Poole was a member of the Mining Society of Nova Scotia, of the Canadian Society of Civil Engineers, F.R.S., Canada, F.G.S., and of the Nova Scotia Institute of Science, in which he took an active part. He was also a contributor to various technical journals, to the reports of the Canadian Geological Survey, to the Journal of the Geological Society, etc.

"He married Florence, second daughter of the late Col. Hon. J. H. Gray, C.M.G., Charlottetown, formerly of the 7th Dragoon Guards, who survives him. To her with the family we extend our deepest sympathy. In the death of Dr. Poole Nova Scotia loses one of its most prominent scientific men."

## C. H. McDougall.

Trail, B.C., May 18.—Despatches last Saturday brought the unpleasant news that Lieut. Clarence H. McDougall, formerly construction superintendent for the Consolidated Company, had been killed at the front in France.

Mr. McDougall, who had been in the employ of the Consolidated Mining and Smelting Co. of Canada for some ten years, had a host of friends all through the Kootenays, having lived in several parts of the district while looking after various phases of the development of the company's properties. At one time he was superintendent of the Sullivan mine at Kimberley and of the St. Eugene mine at Moyie. For a year or two he had charge for the company of the Snowshoe mine, Phoenix, which was under lease to the Consolidated. He had also been superintendent of the Centre Star mine at Rossland.

He had an interest in the Richmond-Eureka mine near Nelson, and was known as one of the most competent engineers in the Kootenays, it being the opinion of his former associates in Trail that he was one of the



brightest men in the profession in British Columbia. He was a McGill graduate of 1904, a native of Clifton, Nova Scotia, and about 36 years of age when he fell for his country in France.

## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA

When the last correspondence from British Columbia was written it seemed likely that the labor difficulties in the Crow's Nest district of British Columbia and the neighboring Province of Alberta were approaching settlement. Now, two weeks later, an adverse vote having been meanwhile given by a majority of the miners concerned, the trouble appears more aggravated than before that vote was taken, and what the eventual outcome will be can not, under existing unfavorable conditions be forecasted, except as a mere guess, without foundation of fact or reasonable expectation to warrant any conclusion being arrived at. Shortly, the members of the Western Coal Operators' Association assert that they have conceded all that they believe they are warranted in doing, while the representatives of the miners and other employees make it appear that they are confident they can succeed in wringing from the mine owners practically anything they shall ask, and they will not work unless they are granted greater concessions than the operators now say they will make to them, at least if the practical ultimatum of the latter is to be relied on. A press despatch from Calgary, Alberta, says, in part, that "the miners' representatives are again in conference here and to-day (May 10th) was spent in getting the preliminary business of the meeting over. Every miners' union in the district is represented and the meeting is planning to make the struggle between the operators and the miners effective on account of organization among the miners. The miners have communicated their point of view to the Minister of Labor and all expect that the Government will soon take some action. In fact, from expressions made by the miners' union representatives, it is evident that the men themselves consider that Government intervention is already demonstrated to be a necessity." Another statement made in the despatch was that "nearly every operator who participated in the recent meeting which decided to hold no further negotiations with the men has left Calgary for home." A further statement made follows: "The real factor in the dispute is stated by officials to be the rapidly increased cost of living and that only, although it was felt that the eight-hour day for all 'outside' men, and a number of local adjustments asked for in the original agreement were important. While practically all the men in the southern part of the district are out, there are still 700 in the Brule Lake district along the Grand Trunk Pacific and Canadian Northern railway lines who are working. No strike has been authorized by the district meeting, and until that is done there are, technically speaking, no men on strike."

The effect of the labor troubles on ore production in Kootenay and Boundary districts is in some measure shown by the following figures giving monthly totals of ore receipts at the Consolidated Mining and Smelting Company's smelting works at Trail, West Kootenay, for the four expired months of the current year: Receipts in April 24,909 tons, in March 43,979 tons, in February 40,967 tons, in January 36,570 tons; total for

the four months 146,425 tons. The chief falling off was in April; it appears likely that there will be a further decrease for the month of May. For the corresponding four months of 1916 the total was 160,168 tons. The decrease in quantity of ore mined and smelted in Boundary district this year to date is probably considerably larger than in Kootenay, while to-day (May 16th) the largest mines and smelting works in the district, namely, those of the Granby Consolidated Company, are closed pending settlement of the Crowsnest coal miners' strike and a renewal of coke supplies for the blast furnaces of the company's smelter at Grand Forks.

### East Kootenay.

In contrast to the situation in other parts of the Crowsnest district is that shown in the following news paragraph, taken from the Fernie Free Press: "Inspector of Mines O'Brien returned on May 12th from Corbin. He says nearly all the men in that camp are working as usual. Indications point toward the men at Corbin quitting the union, as they are becoming tired of the ceaseless turmoil and strife existing in the District Union.

The output of ore from the Consolidated Mining and Smelting Co.'s Sullivan mine was well maintained throughout the month of April, the total shipped to Trail during that month having been 14,410 tons. For the first week in May the proportion was smaller, having been only 2,438 tons. Incidentally, it may be mentioned that on May 5th the Nelson Daily News stated that, as the result of a conference between representatives of the men employed at the Sullivan mine, Kimberley, and officials of the Consolidated Mining and Smelting Company, regarding certain claims made by the employees at the mine, which conference was held in Nelson the previous day, proposals were made by the company which will be submitted to the men at the Sullivan mine for their consideration.

### NORTHERN ONTARIO.

#### Kirkland Lake.

The vein at the 600-ft. level of the Kirkland Lake gold mine has been found to be about 42 ft. in width. The vein is highly mineralized and at places free gold is in evidence. A hoist is to be installed at this level, preparatory to sinking to the 700-ft. The new level established at this mine is the deepest in the Kirkland Lake camp and goes far towards demonstrating the fact that the ore-bearing veins will be found to continue to very deep levels similar to those encountered in the Porcupine camp.

The proven gold bearing zone has now been determined to be at least two miles in length, extending from the Tough Oakes mine at the east to the Kirkland Lake gold at the west end of the zone. The Tough Oakes has been operating for a number of years and is producing at the rate of nearly a million dollars annually, while the Kirkland Lake gold has the distinction of having the deepest shaft in the district and consistent values have been found all the way down. Along the strike of the mineralized zone between these two properties are to be found the Teck-Hughes, the Lake Shore and the Wright-Hargraves, which may all be said to have passed the prospective stage. A number of other properties in the district are also being worked and satisfactory results are being obtained on most of them.





Tough-Oakes Mill, Kirkland Lake.

### Canadian Kirkland.

A seventh vein has been uncovered on the south end of the west claim of the Canadian Kirkland property at Kirkland lake. This new discovery is about three feet in width and contains a dark greenish quartz which is said to give an assay return of \$4.80 per ton from a channel assay from the vein. So far exploration work has been confined to the one claim and the management is well pleased with the results. During the summer a gang of men will be kept constantly trenching and sinking test pits and otherwise putting the property in shape for determining the policy which will be pursued when deep mining is commenced.

### Elliott Kirkland.

Drifting is going on at the 125-foot level of the Elliott Kirkland mine, where it is anticipated that the extension of the Kirkland Lake Gold vein will be encountered. This vein at the 100-foot on the latter property was about a foot in width and it would not be surprising if it were found to be narrow on the latter property. As soon as this vein is located the management will commence sinking the shaft to a deeper level where further exploration work will be carried on.

### Minaker Kirkland.

Owing to the fact that a second substantial payment has been made on the Minaker-Kirkland Gold Mines, Ltd., it is anticipated more extensive mining operations will be carried on from this time forward. Several promising veins with a number of free gold showings have been uncovered on the property during the past eight months and the property is considered to have very fair chances of success.

### Hunton Kirkland.

A small force of men have been set to work at the Hunton-Kirkland property making preliminary preparations for the taking on of a large force in the near future, when the work of proving the merits of this property will be energetically carried on.

### McIntyre.

The McIntyre Mill at Porcupine is now treating upwards of 500 tons per day, and the mill heads are being maintained around \$11. The production will total around one and three-quarter million dollars annually.

The porphyry-Keewatin contact extends for about one mile along this property and wherever extensive development work has been carried on it has been proven to be productive of good results. The most gratifying feature is the fact that the deeper the work is carried the higher is the grade of ore encountered. At the 1000-foot level a drift over a thousand feet in length has already been driven along this contact and the working is in good

grade ore for the entire distance. This drift extends from the McIntyre across the McIntyre Extension and into the Jupiter property and is about twenty eight feet in width. It is understood that this huge drift will be utilized as the main haulage way for the properties and will be electrified. When it is considered that prominent mining men are of the opinion that the orebodies in the Hollinger-McIntyre zone will continue to greater depths than present-day mining facilities can be operated, some idea of the immensity of this mine can be gleaned.

On the upper levels of the property much faulting of the formation occurred and gave considerable trouble. However at the deeper levels this has disappeared and geological conditions are very favorable to economical mining.

### Schumacher.

With twelve machines working underground on the Schumacher mine at Porcupine rapid progress is being made in developing the workings of the mine and blocking out the orebodies, and when the annual report is issued in the near future it will show the wisdom of the policy of the company to conserve the net profits which amount to approximately \$3,500 per month for this purpose, and the future of the mine will be greatly benefited thereby. The mill is treating approximately three thousand tons monthly, from which about \$20,000 in gold is recovered. Mining and milling expenses are about \$16,500. Diamond drilling has proven that the values increase with depth and arrangements will be made to reach lower levels with all possible speed, when it is anticipated the mill heads will be substantially increased.

### West Dome.

A vein about eight feet in width has been cut at the third level of the West Dome Consolidated, and is said to contain fair milling values. The vein was located by diamond drill some time ago, and a crosscut was run from the drift at this level, which is about 250 feet from the shaft. The vein was cut after about fifty feet of crosscutting had been accomplished.

### Beaver.

Satisfactory results are being obtained in development of the high grade veins encountered on the 1600-foot level of the Beaver early in the year, and stoping is being energetically carried on. On the Temiskaming property four machines are driving the crosscut east and west with the expectation of cutting the extension of the Beaver vein on this property and about 100-feet of crosscutting has already been done. It is hard to indicate just how much work will be necessary to encounter the vein as the angle at which it is running cannot be definitely determined from the Beaver with regard to



the Temiskaming. Fourteen machines are in operation on the Temiskaming and the mine is understood to be in very good condition generally.

#### Shamrock.

Work on the Shamrock mine adjoining the Beaver is now confined to the 200 and 300 foot levels and consists chiefly in crosscutting. Eight men and one machine are employed. The general direction of the Beaver veins at the 1,600-foot level are in the direction of the Shamrock, and may decide the management to sink to deeper levels when the value of the Beaver discoveries at this depth have been more definitely established.

#### Hargraves.

About thirty men and four machines are employed at the Hargraves property, Cobalt. The winze from the 375-foot level has reached a depth of 50-feet and a crosscut will be run to pick up the vein which dipped out of the winze. A quantity of high grade has been bagged and considerable mill rock broken down and it is expected a shipment will be made from the property in the near future.

#### Trethewey.

A shoot of high grade ore containing approximately \$8,000 worth of silver was encountered in one of the old stopes of the Trethewey mine recently. Although not very extensive, the shoot produced a handsome revenue from an unexpected quarter.

#### Nipissing.

Monthly report of the Nipissing Mining Company for April states that nothing unusual was encountered on the property. The average width and grade of ore was maintained in the various stopes. The company mined ore of an estimated value of \$259,082, and shipped bullion of an estimated net value of \$517,719 from Nipissing and customs ore. Exploration work in the new areas encountered nothing of much value.

#### Kerr Lake.

April production from the Kerr Lake Mining Company established a record, when 250,683 ounces was recovered. This is the first time the quarter-million ounce mark has been passed. The monthly production for the year to date has been:—

|                |         |
|----------------|---------|
| January .....  | 215,206 |
| February ..... | 206,474 |
| March .....    | 219,335 |
| April .....    | 250,683 |

The company has subscribed for \$300,000 of the United States Liberty Loan, which pays interest at the rate of 3½ per cent.

#### Pittsburgh-Lorrain.

At the Pittsburgh-Lorrain in South Lorrain (formerly the Currie) about twenty-five men are employed and the work is confined chiefly to the 300-foot level where values at times are said to be very encouraging, but are not very consistent. A diamond drilling programme is being carried out to test the formation at the 800 and 900-foot depths.

#### Lorrain Consolidated.

Work on two veins on the Lorrain Consolidated is being carried on at the 260-ft. level and while the veins are encouraging the values so far encountered are not very high. Drifting is being continued. The old plant of the Haileybury Frontier mining company is being used by the Lorrain Consolidated and is giving good satisfaction.

#### Boston Creek.

The snow is disappearing rapidly from the bush around Boston Creek and judging by the number of prospectors commencing to do their work in this district

the coming summer is going to be a very active one for this new camp.

#### Matachewan.

The formation of the district where the gold finds were made last fall near Fort Matachewan on the Mont-real river is said to be similar to that of the producing area of the Kirkland Lake camp, and prospectors returning from the district are of the opinion that there will be some surprises in store for those doing their assessment work here during the coming summer. At present there are about fifty prospectors on the ground and others are preparing to go in.

#### Merger of Boston Creek Properties.

A deal is said to be pending which will include the R.A.P. Syndicate properties and the Boston Creek Mine at Boston Creek. Development work on the Boston Creek mine at the 300 and 400-foot levels is said to be very encouraging.

#### Tashota.

Favorable results are said to be attending development work on a number of properties in the Tashota mining field. The Tash-Orn shaft is down 115 feet and at the 100-foot level 250-feet of drifting has been done, and considerable free gold is in evidence in the vein which is the full width of the shaft. The wall rock is also said to carry fair values. This company also own the King Dodds property on the Kowkash river at Howard's Falls and it is understood that if they decide to put in a larger plant at the Tash-Orn property they will move the present plant to the King Dodds.

On the Hull-Kipper claim near Tashota a shaft has been put down about fifty feet and the results met with place the property in a class with very fair prospects.

#### McIntyre.

McIntyre-Poreupine is now producing gold bullion at the rate of upwards of \$150,000 monthly. This is considerably above the Dome figures and is not far short of the Hollinger Consolidated on its present reduced rate of production. McIntyre has a full force of men employed and the mill is now treating about 530 tons daily. It is understood arrangements will be made shortly for the installation of another milling unit with a view to raising the capacity to 1000 tons daily. Mill heads maintain around \$11 to the ton and provided such expansion is effected, production would total about \$11,000 daily, which works out at \$330,000 monthly or nearly \$4,000,000 annually. The mine is capitalized at just \$4,000,000, and less than 3,500,000 shares are issued. It therefore follows that McIntyre will probably ultimately produce bullion in excess of issued capitalization. No mine in the north country would appear to have a future any better than McIntyre.

#### SILVER PRICES.

|            | New York. | London. |
|------------|-----------|---------|
|            | cents.    | pence.  |
| May 8..... | 73¼       | 37½     |
| " 9.....   | 73¼       | 37½     |
| " 10.....  | 74½       | 37½     |
| " 14.....  | 74½       | 38      |
| " 15.....  | 74½       | 38      |
| " 16.....  | 74½       | 38      |
| " 17.....  | 74½       | 38      |
| " 18.....  | 74½       | 37½     |
| " 19.....  | 74½       | 37½     |
| " 21.....  | 74½       | 38      |
| " 22.....  | 74½       | 37½     |
| " 23.....  | 74½       | 37½     |
| " 24.....  | 74½       | 37½     |

## MARKETS

## TORONTO MARKETS.

Cobalt oxide, black, \$1.50 per lb.

Cobalt oxide, grey, \$1.65 per lb.

Cobalt metal, \$2.25 per lb.

Nickel metal, 45 to 50 cents per lb.

White arsenic 15 cents per lb.

May 28, 1917—(Quotations from Canada Metal Co., Toronto)

Spelter, 12½ cents per lb.

Lead, 14 cents per lb.

Tin, 70 cents per lb.

Antimony, 30 cents per lb.

Copper, casting, 34 cents per lb.

Electrolytic, 36 cents per lb.

Ingot brass, yellow, 23 cents; red, 25½ cents per lb.

May 28, 1917—(Quotations from Elias Rogers Co., Toronto)

Coal, anthracite, \$9.50 per ton.

Coal, bituminous, nominal, \$9.00.

## NEW YORK MARKETS.

Connellsville Coke—

Furnace, spot, \$8.25 to \$8.50.

Furnace, contract, \$8.00 to \$8.50.

Foundry, spot, \$9.50 to \$10.00.

Foundry, contract, \$9.00 to \$9.25.

Straits Tin, spot, f.o.b. nominal, 65.50 cents.

Copper—

Prime Lake, nominal, 31.50 to 32.50 cents.

Electrolytic, nominal, 32.00 to 32.50 cents.

Casting, nominal, 30.00 to 31.00 cents.

Lead, Trust price, 10.00 cents.

Lead, outside, nominal, 11.00 to 11.50 cents.

Spelter, prompt western shipment, 9.42½ to 9.67½ cents.

Antimony—

Chinese and Japanese, nominal, 24.50 to 25.00 cents.

Aluminum—nominal.

No. 1 Virgin, 98-99 per cent., 59.00 to 61.00 cents.

Pure, 98-99 per cent. remelt, 56.00 to 58.00 cents.

No. 12 alloy remelt, 41.00 to 43.00 cents.

Powdered aluminum, 85.00 to 90.00 cents.

Nickel—Shot and ingot, 50.00 cents.

Electrolytic, 55.00 cents.

Quicksilver, \$100.00.

Platinum—

Pure, \$105.00.

10 per cent. iridium, \$110.00.

Cobalt (metallic), \$1.70.

Tungsten, per unit—

Sheelite, \$17.50.

Wolframite, \$17.00.

Silver (official), 74½ cents.

## COBALT AND PORCUPINE STOCKS.

As of May 28th, 1917.

## Silver.

|                            | Asked. | Bid.  |
|----------------------------|--------|-------|
| Bailey .....               | .04    | .03   |
| Beaver Con. ....           | .36½   | .36   |
| Buffalo .....              | 1.25   | 1.00  |
| Chambers Ferland .....     | .10½   | .10   |
| Coniagas .....             | 3.70   | 3.55  |
| Crown Reserve .....        | .29½   | .29¼  |
| Gifford .....              | .04    | .03¾  |
| Gould .....                | .00¾   | ...   |
| Great Northern .....       | .11    | .10   |
| Hargraves .....            | .12½   | .12   |
| Hudson Bay .....           | ...    | 38.00 |
| Kerr Lake .....            | 5.00   | 4.70  |
| Kenabeek Con. ....         | .29    | .27   |
| La Rose .....              | .48    | .40   |
| Lorrain Consolidated ..... | .20    | .16   |
| McKinley Darragh .....     | .54    | .52   |
| Nipissing .....            | 7.35   | 7.15  |
| Ophir .....                | .09¾   | .08½  |
| Peterson Lake .....        | .10    | .09½  |

## Gold.

|                          | Asked. | Bid.  |
|--------------------------|--------|-------|
| Apex .....               | .05½   | .05¼  |
| Boston Creek .....       | ...    | .60   |
| Davidson .....           | .78    | .61   |
| Dome Extension .....     | .13½   | .13   |
| Dome Lake .....          | .18    | .17   |
| Dome Mines .....         | 12.50  | 12.00 |
| Eldorado .....           | .02    | ...   |
| Foley O'Brien .....      | .75    | ...   |
| Gold Reef .....          | .02¾   | .02½  |
| Homestake .....          | .55    | .45   |
| Hollinger C. ....        | 4.45   | 4.40  |
| Hunton Kirk. ....        | .20    | ...   |
| Inspiration .....        | .08½   | ...   |
| Keora .....              | .12    | ...   |
| Kirkland Lake .....      | .39    | .36½  |
| McIntyre .....           | 1.48   | 1.47  |
| Newray M. ....           | .66..  | ...   |
| Porcupine Crown .....    | .57    | .56   |
| Porcupine Gold, xr ..... | .02    | ...   |
| Porcupine Imperial ..... | .03    | .02¾  |
| Porcupine Tisdale .....  | .02¼   | .01¼  |
| Porcupine Bonanza .....  | .09    | ...   |
| Vipond .....             | .39½   | .38½  |
| Preston East Dome .....  | .04    | .03¾  |

NICKEL



THE MOND NICKEL COMPANY, LTD.

39 Victoria Street, London, S.W.

Also Makers of

Copper Sulphate,  
Nickel Sulphate, and  
Nickel Ammonium Sulphate



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The Company continues the notice of the former owners of these patents that it is ready to grant licenses for the use of this process to those who wish to install and use it in Canada, as well as in other parts of North America.

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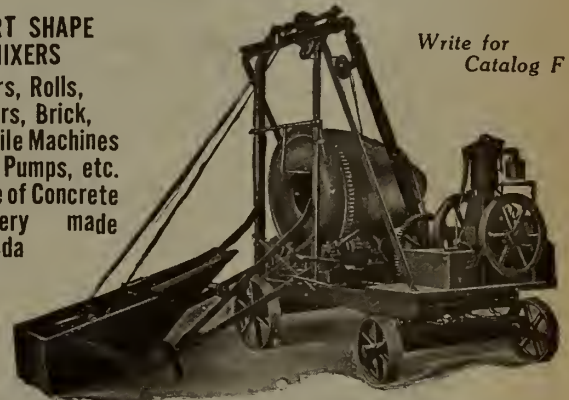
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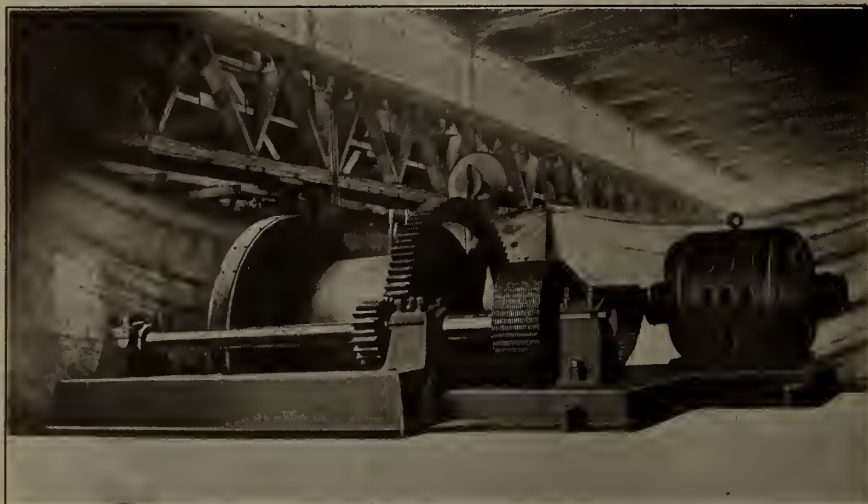
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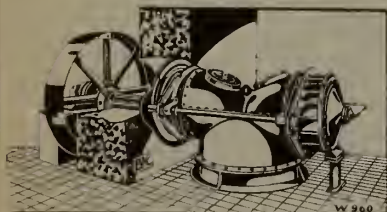
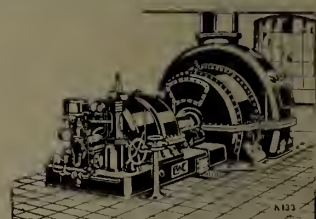
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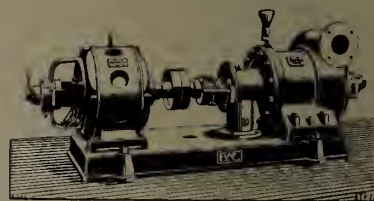
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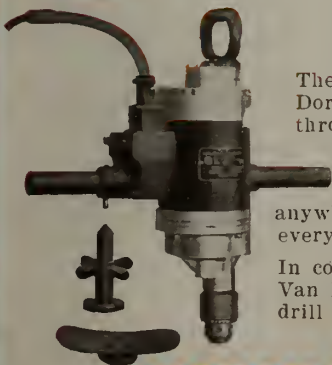
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The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

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Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

### GEOLOGICAL SURVEY

#### Recent Publications

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Memoir 85. Road Material Surveys in 1914, by L. Reinecke.

Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.

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Memoir 93. The Southern Plains of Alberta, by D. B. Dowling.

Memoir 94. Ymir Mining Camp, British Columbia, by Charles Wales Drysdale.

Memoir 95. Onaping Map-Area, by W. H. Collins.

Map 59A. Wheaton, Yukon Territory.

Map 60A. Wheaton, Yukon.

Map 67A. Kirkfield Sheet, Victoria County, Ontario.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

Map 175A. Ymir, Kootenay, British Columbia.

Map 176A. Graham Island, Queen Charlotte Islands, British Columbia.

Map 177A. Southern Portion of Graham Island, Queen Charlotte Islands, British Columbia.

Map 180A. Espanola Area, Sudbury District, Ontario.

Map 184A. Roberval, Lake St. John County, Quebec.

Map 187A. Southern Plains of Alberta.

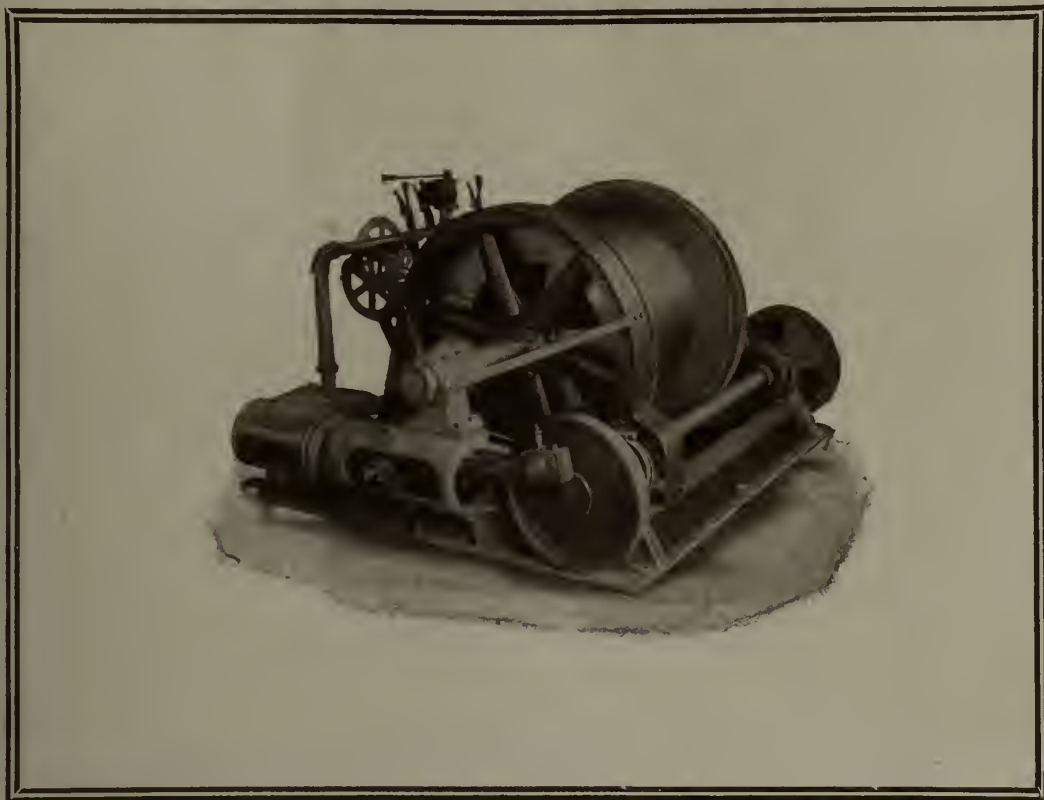
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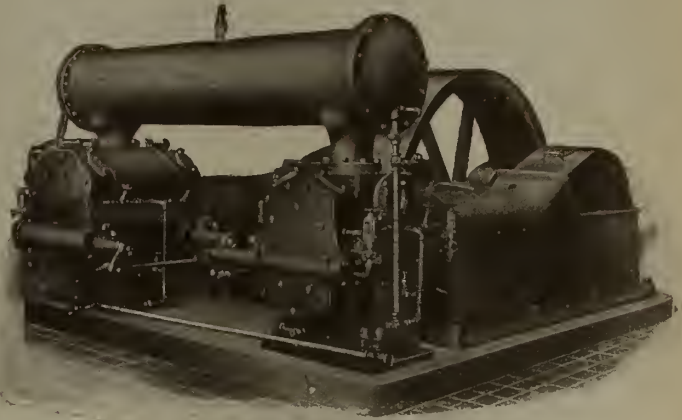
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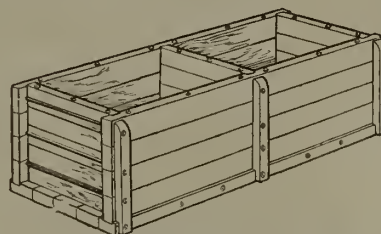
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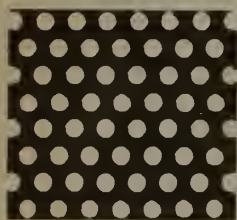
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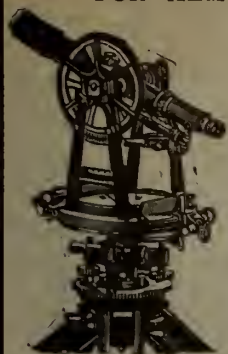
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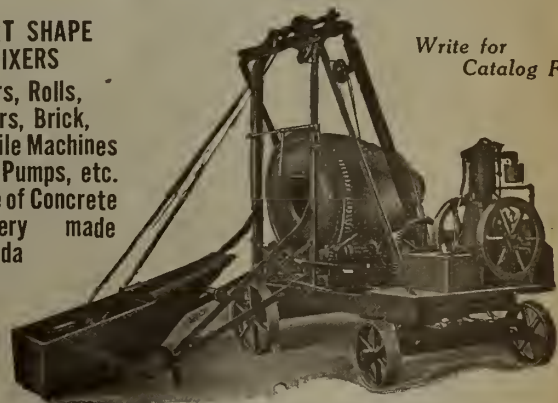
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# THE CANADIAN MINING JOURNAL

VOL. XXXVIII.

TORONTO, June 15th, 1917.

No. 12

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the  
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Editor

REGINALD E. HORE

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### CIRCULATION

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### THE MINISTER OF MINES.

It has been pointed out to us that some of our remarks on the need of a real Minister of Mines appear to be an attack on the Government and the present Minister. As this Journal is not concerned with party politics, however, we trust that our remarks will be properly interpreted as criticism of our method of government. The men who have held the portfolio of Minister of Mines should be given credit for any work they have done, for it is obvious that they were not expected to do very much. Otherwise properly qualified men would have been chosen and a suitable salary provided for.

If we have been correctly informed the recent holders and the present holder of the portfolio of Minister of Mines have really endeavored to do something. They have recognized that they are not qualified for the position; but have accepted the appointment with the intention of at least doing their best. For doing their best they deserve credit. It is perhaps because of recognition that these men have made an honest effort to fill the position that mining men have refrained from saying what they think about the system.

To maintain silence while dissatisfaction exists may be good policy under certain conditions; but we doubt whether the mining industry will receive proper attention if mining men hesitate to criticize the system that they know to be rotten.

At no time have the basic industries of the country been more in need of careful governmental supervision than now. And yet mining, next to agriculture our greatest basic industry, is without a salaried Minister.

### THE MISREPRESENTATION OF LABOR.

Commenting on the labor situation in Northern Ontario, Mr. Homer L. Gibson says in Gibson's Fortnightly Mining Review:

"The mine managers have practically unanimously ignored the request of the Miners Union for a conference to discuss the points of difference. This seems, then, to put the issue squarely up to the Union.

"The managers contend that since the miners are already receiving an amount fully equal to their demands, under the bonus system now almost universally in vogue, their claim that such demands are inspired by the high cost of living are inconsistent, and that such demands constitute, in fact, a demand for recognition of the Union. This they seem determined not to grant.

"We understand that individual managers have offered to discuss the matter with a committee of their own employees as such, but have absolutely refused to enter into any negotiations with them as representatives of the Miners Union. If such is the case it would seem regrettable if the miners cannot be prevailed upon to waive, in these times of world strife, the temporarily unimportant point of recognition of the Union, and get together with their employers as man to man. We be-

lieve that such a discussion would lead to better feeling all round and would solve the difficulty.

"It is probable that the members of the Union will be asked to vote on the question of applying to the Minister of Labor for a Royal Commission. If such commission be asked for and granted, it will probably be thirty days before it can commence its sittings, and probably another thirty days before a decision can be expected. No immediate removal of this situation as an uncertainty is therefore in sight."

As Mr. Gibson points out, miners in Northern Ontario who are desirous of conferring with their employers can do so readily enough. The people who find the managers unwilling to confer with them are the officers of the Union which in Northern Ontario as in other parts of North America pretend to represent the miners.

If the miners of Northern Ontario were really anxious to discuss the labor situation with their employers they would not allow the men who direct the affairs of the Western Federation of Miners to intervene. The records of these men are too well known.

Protracted strikes are generally so disastrous to the miners that they react on the instigators. The Federation leaders are therefore not anxious to recommend strikes. They prefer to make threats. By threats the officers of the Federation hope to accomplish their ends without arousing the anger of their dupes. Unfortunately for them the mine managers of Ontario have called their bluff.

Until the miners of Northern Ontario nominate real representatives it cannot be assumed that they are desirous of holding conferences with their employers. A request for a conference from a branch of the Western Federation of Miners is no more a request from the employees of the mining companies, than is the statement of Mr. James Simpson an expression of the sentiments of the workmen of Toronto.

It is said that the marble for the new Houses of Parliament at Ottawa is to be purchased in the United States. The estimates call for marble to the value of \$200,000. As there are in Ontario and Quebec deposits of suitable stone, it is strange that Canadian quarries are not to supply the marble needed for the Canadian public buildings. Does the fault lie with the Government or the owners of the quarries.

#### ENLARGING ACID PLANT.

Construction has been started on the enlargement of of the sulphuric acid plant of the Consolidated company in Trail, the increase being 50 per cent. or up to a capacity of manufacturing some 20 tons of the acid daily. The addition will be about 100 feet in length, giving a total length of the acid building of 280 feet, with a width of about 55 feet.

This enlargement has been necessitated by the constant demands of the electro-chemical departments of the works in the refining of metals, each of which has been made larger than at first intended, thereby making

an increasing demand for the acid. In addition to this it has been almost impossible to secure hydrofluosilicic acid at any price—which is made from sulphuric acid and other ingredients—and this was a prime necessity in the refining of the metals.—Trail News.

#### GRANBY CONSOLIDATED.

Through fuel shortage at its Grand Forks plant it has been impossible for Granby Consolidated to operate that unit since early in April, thereby entailing a loss in production of approximately 2,000,000 pounds of copper and a monetary loss of about \$150,000. Labor trouble tied up the Crow's Nest Pass Coal Co., but miners will probably get back to work soon, which will permit of fuel shipments to Grand Forks.

It is now costing about 21 cents a pound to produce copper at Grand Forks, against about 17 cents a year ago. Increased labor and material costs account for this increase. On 28 cent copper, profits per pound would be but seven cents compared with 11 cents a year ago.

Only under highpriced copper can operations be maintained at what was originally the only property of the Granby Co. Twenty-cent copper would necessitate its shutdown, but the investment which the management was wise enough to make several years ago in other mines and a most modern smelting plant will find adequate return in operations centering at Hidden Creek where the Anyox smelter handles ore from its own and surrounding mines.

The Anyox smelter in May handled about 70,000 tons of ore, the same as in April, which, assuming a yield of 40 pounds of copper per ton would result in a production of 2,800,000 pounds. The smelter equipment will be increased through the addition of two new reverberatory furnaces while flotation concentration will also be given a trial in an experimental plant. Eventually Granby may make its own coke at a very material saving from what has to be paid at the present time.

The Midas mine in Alaska, which Granby secured several years ago, will commence shipments shortly to Anyox. This property, which was once examined by Guggenheim engineers gives promise of developing into a large and important mine. Its ores carry precious metals values aggregating \$4 per ton, while its copper averages from 4 per cent to 6 per cent.

Assuming an 11-cent cost at Anyox and a 29-cent copper price. Granby during the past two months has been earning at the rate of about \$27 a share (eliminating Grand Forks, closed down for the period) whereas it has earned on higher-priced copper at the rate of over \$40 a share with both properties running.

It is understood that Granby to-day has cash and copper in excess of all liabilities of approximately \$3,500,000. The company closes its fiscal year on June 30, although it does not make public its annual report until October.—Boston News Bureau.

#### COPPER AND SILVER IN MICHIGAN IN 1916.

The production of copper in Michigan in 1916, as reported by the United States Geological Survey, Department of the Interior, was 273,692,525 pounds, valued at \$67,328,361, and that of silver was 716,640 fine ounces, valued at \$471,549, a combined value of \$67,799,910. This is an increase of \$21,078,251, or 45 per cent. over the value of the output in 1915.

The average price of copper per pound for 1916 was 24.6 cents, compared with 17.5 cents in 1915.



**MILITARISM vs. PATRIOTISM.**

By F. W. Gray.

In the issue of this Journal for 1st October 1914, the writer referred, under the above caption, to the action of the Sydney Trades & Labor Council in protesting against the formation of a Home Guard Regiment in Sydney, because of the tendency of such an organization "to foster the abuse of militarism."

A good deal of water has flowed under the mill since October 1914, and the blood of freemen has been spilt in Freedom's cause as never before. In October 1914 there was being enacted that "Calvary of Ypres," in which the regular Army of Great Britain sacrificed itself to the point of practical obliteration. We did not know then, we were to learn later, when the danger was less imminent, how dreadful was that fight, and how nearly our cause was lost.

There was perhaps at that time some excuse for ignorant optimism, as we had not then become acquainted with the truth regarding the German and his aims which we have since seen expressed in such deeds as the sinking of the "Lusitania," the use of poison gas, the Zeppelin raids, the Belgian deportations, the Armenian massacres, the torpedoing of hospital ships, the filthy antics of the Prussian ape in the recent retreat at Noyon, and other infamies as numerous as they are execrable.

Evidently the Sydney Trades & Labor Council has not learnt the obvious lesson of events, because this body has again expressed its views by a resolution opposing compulsory military service on the ground that it "is opposed to democracy, and the cause of freedom as enjoyed by all England's Dominions."

It is the reason adduced for the resolution that calls for particular attention, because it is typical of the thinking of a certain type of trade unionist. There are reasons connected with party politics in Canada that could be urged—by those who still believe in such ancient shibboleths as party politics—but these questions are not in reason here. The same confused thinking is still apparent in the minds of the leaders of the Trades and Labor Council as existed in 1914. At that time the writer stated: "The depreciation of home militias, for reasons that have been sufficiently obvious in Cape Breton, in Vancouver and in Colorado, is a plank in the political platform of the Trades and Labor Congress and its affiliations on the other side of the line, and this attitude has unfortunately clouded the thinking of many well-meaning men, who, probably, if they thoroughly dissected their mental processes would find themselves to be patriots in the truest sense of that much abused word."

Evidently also, the Sydney Trades & Labor Council is but following the lead of the heads of their organization, as witness the recent discordant action of Mr. J. C. Watters in Washington, and the reported utterances of the officers of the Trades and Labor Congress at Ottawa. The most vociferous exponents of this attitude are to be found in Vancouver, and—unfortunately it is impossible to avoid the statement—this deplorable point of view is most apparent just in those centres of Canadian population where international trades unionism, so-called, has been most prominent and active.

The machinations of German propaganda, masquerading under the guise of pacifism, ramified throughout the whole of trades unionism in the United States, and every honor is due to Mr. Samuel Gompers for his refusal to be deceived by the intrigues of German agents.

The attitude of advanced thinkers and leaders of the proletariat in the ranks of the Allies is typified in men like Viviani of France, Henderson of Great Britain, Kerensky of Russia, and Gompers in the United States.

With selective conscription in the United States, with total conscription in Great Britain and France, with conscription in New Zealand, and compulsory military training in Australia, are not the self-styled leaders of labor in Canada a little behind the procession when they refer to the mild form of selective conscription proposed in Canada as "opposed to democracy and the cause of freedom enjoyed by all England's Dominions?" And is Canada a "Dominion of England?" Canada is one of the allied democracies of the British Empire, proud of that connection and fighting for it, and, as Sir Wilfrid Laurier said recently, "We Canadians stand to-day prouder of our British allegiance than we were three years ago."

The unfair part of the propaganda of the Trades & Labor Congress, however, is that it represents the feelings of the men it is supposed to voice. The Sydney Trades & Labor Council has mandate to speak for the workmen of Cape Breton. The workmen of Cape Breton Island have enlisted to the extent of not less than six thousand men, and many more would enlist to-day but for the restriction on recruiting the Government was compelled to enforce to maintain the output of coal and steel.

In the same way the utterances of Mr. Watters and Mr. Simpson most emphatically do not represent the feeling of the workmen of Canada. They voice the sentiments of a few men who have conceived the idea that "militarism" is the first of vices, and who in their confused thinking cannot dissociate the defence of freedom and democracy from the oppressive aims of armed auto-cracy.

The choice of Canada to-day lies between conscription until German auto-cracy is finally and thoroughly defeated, or conscription for all time. There is another alternative, namely absorption in the United States and loss of independence, but that will not help those who object to conscription at this time, because there too, as in all the nations that aspire to national freedom, the choice is the same.

The very fact that the leaders of the Trades and Labor Congress can meet and voice their academic protests in "because freemen—Englishmen, Scots, Welshmen, Irishmen, and the long, long list of British peoples in their infinite complexity and their essential onenses, are fighting, not talking. The analogy with Russia in her present chaotic condition is obvious. There, "idealism run mad" is not overwhelmed because the Allies are keeping the Germans busy on other fronts.

Trades unionists object to military measures because they break up and interfere with the ordered progress of democracy. Some Labor leaders have talked of peace and a desire to remain at peace, as though the desire in itself were a virtue sufficiently potent to connote also the ability to remain at peace. An unshackled tiger, a consuming fire, will break up and interfere with the peace of a household, but still the average householder will look for his gun, and will call the fire department, under such circumstances.

Unless the leaders of the Trades and Labor Congress wish to be superseded and dismissed from office by the unionists who will some day return from the front they must wake up. That these men do not voice the opinions of those they are supposed to lead is notoriously well-known.

In 1914, we stated it would be an injustice to suppose that Canadian Trades unionists, despite the opinions of their leaders, would play any other part in the war but that of men who fight for home and country, and quoted Bret Harte's memorable verse, which has since assumed vastly greater significance:



Hark! I hear the tramp of thousands  
And of armed men the hum;  
Lo! a nation's hosts have gathered  
Round the quick alarming drum,—  
Saying, "Come,  
Freemen, come!  
Ere your heritage be wasted," said the quick  
Alarming drum.

And the great heart of the nation, throbbing,  
answered, "Lord, we come."

Events have proven the correctness of that estimate of Canadian trades unionism. They did come. Thank God they came. The nation that gave birth to Bret Harte came also. Neutrality between right and wrong became impossible so soon as the righteousness of the cause of allied democracy became plain.

The dislike of trades unionists to "militarism" is genuine, and is shared by the average citizen of the British Empire. It is an attempt to create an invidious class distinction for trade unionists to arrogate to themselves this universal hatred of military autocracy.

The attitude of most all of us is well described by "Diplomat" in an open letter to Sir Douglas Haig which appeared in a London newspaper. This writer says the British Armies in France commanded by Haig look upon war as "an accursed anachronism, a dirty, unchivalric, tedious, unseemly business, a fool's game as well as a friend's. They are under no illusions. But they will 'stick it' to the death, because they know there is no other way to abolish the reign of the devil upon earth, and win for reasonable men the chance of a sweeter and better life."

The compelling reason for conscription in Canada, as elsewhere in the Empire, is to put the full effort of the country into the prosecution of the war. No other reason would have forced the Government to otherwise attempt such a measure. Under these circumstances, therefore, to characterize the Premier's action "as opposed to democracy and the cause of Freedom," is to utter an absurdity.

To quote Mr. Balfour before the House at Ottawa:

"We have put our last dollar on democracy, and if democracy fails us then we are bankrupt indeed." "But, he added, "I know that democracy will not fail us."

### IRON AND STEEL IN CANADA, 1917.

The Mines Branch of the Department of Mines has received from the producers complete returns of the production of pig iron in Canada and with the exception of three small plants, complete return of the production of steel ingots and castings during the first three months of 1917.

The total production of pig iron during the three months was 276,777 short tons, or an average monthly production of 92,259 tons, as against an average monthly production throughout 1916 of 97,438 tons.

Furnaces were in blast at Sydney, and North Sydney, Nova Scotia, Hamilton, Port Colborne, and Sault Ste. Marie, Ontario, and a small electric furnace was operated at Orillia producing pig iron from scrap steel. The blast furnace at Deseronto was idle throughout the period.

The total production of steel ingots and castings during the three months was 403,880 short tons, or an average monthly production of 134,627 tons, as against an average monthly production of 106,268 tons during 1916.

The monthly production, exports and imports, 1916 and 1917, are shown in the accompanying tables:

#### PIG IRON IN CANADA.

##### Monthly Production, Exports and Imports.

|                    | Production. |         | Exports. |       | Imports. |       |
|--------------------|-------------|---------|----------|-------|----------|-------|
|                    | Tons.       | Tons.   | Tons.    | Tons. | Tons.    | Tons. |
|                    | 1916.       | 1917.   | 1916.    | 1917. | 1916.    | 1917. |
| January ...        | 562,097     | 89,187  | 1,635    | 106   | 4,456    | 5,473 |
| February ..        | or          | 83,801  | 1,393    | 732   | 4,101    | 3,502 |
| March .....        | monthly     | 103,789 | 2,725    | 1,394 | 5,602    | 7,442 |
| April .....        | average     |         | 80       |       | 5,963    |       |
| May .....          | of          |         | 30       |       | 6,489    |       |
| June .....         | 93,683      |         | 221      |       | 3,190    |       |
| July .....         | 92,012      |         | 394      |       | 3,773    |       |
| August .....       | 87,864      |         | 3,902    |       | 3,961    |       |
| September ..       | 102,744     |         | 1,534    |       | 5,001    |       |
| October ...        | 113,608     |         | 4,344    |       | 5,933    |       |
| November ..        | 104,436     |         | 4,055    |       | 3,310    |       |
| December ..        | 106,496     |         | 2,991    |       | 6,351    |       |
| Total ..           | 1,169,257   |         | 23,304   |       | 58,130   |       |
| Monthly average... | 97,438      |         | 1,942    |       | 4,919    |       |

#### STEEL IN CANADA.

##### Monthly Production and Imports.

|                     | Production of steel ingots and direct steel castings. |         | Imports.* |        |
|---------------------|-------------------------------------------------------|---------|-----------|--------|
|                     | 1916.                                                 | 1917.   | 1916.     | 1917.  |
|                     | Tons.                                                 | Tons.   | Tons.     | Tons.  |
| January .....       | 589,553                                               | 130,944 | 4,212     | 13,322 |
| February .....      | or                                                    | 120,568 | 7,288     | 15,213 |
| March .....         | monthly                                               | 152,368 | 5,206     | 32,590 |
| April .....         | average                                               |         | 10,877    |        |
| May .....           | of                                                    |         | 8,542     |        |
| June .....          | 98,259                                                |         | 11,368    |        |
| July .....          | 100,817                                               |         | 10,742    |        |
| August .....        | 107,273                                               |         | 13,412    |        |
| September .....     | 113,411                                               |         | 10,433    |        |
| October .....       | 123,469                                               |         | 12,958    |        |
| November .....      | 124,431                                               |         | 12,723    |        |
| December .....      | 116,265                                               |         | 10,309    |        |
|                     | 1,275,219                                             |         | 118,070   |        |
| Monthly Average ... | 106,268                                               |         | 9,839     |        |

\* The figures given hereunder represent the exports of steel ingots and billets from the United States to Canada and are compiled from the monthly reports of "Foreign Commerce and Navigation of the United States," Washington, D.C.

#### IRON AND STEEL IN CANADA, 1916.

##### Revised Statistics and Comparison with 1915.

Division of Mineral Resources and Statistics, Department of Mines, Ottawa.

|                                                                    | 1915         | 1916          |
|--------------------------------------------------------------------|--------------|---------------|
|                                                                    | Short Tons.  | Short Tons.   |
| Iron Ore—Shipments:                                                |              |               |
| Hematite .....                                                     | 205,989      | 45,541        |
| Magnetite .....                                                    | 59,217       | 19,113        |
| Roasted siderite and hematite....                                  | 132,906      | 210,522       |
| Total shipments .....                                              | 398,112      | 275,176       |
| Sold for export .....                                              | 89,730       | 140,608       |
| Imports (Customs record) .....                                     | 1,504,113    | 2,339,677     |
| Charged to blast furnaces, Canadian ore .....                      | 293,305      | 221,773       |
| Charged to blast furnaces, imported ore .....                      | 1,463,488    | 1,964,598     |
| Charged to steel furnaces .....                                    | 74,872       | 55,059        |
| Shipment from Wabana, Nfld. ....                                   | 568,451      | 1,012,060     |
| Pig Iron—Production by Provinces:                                  |              |               |
| Nova Scotia .....                                                  | 420,275      | 470,055       |
| Ontario .....                                                      | 493,500      | 699,202       |
| Production by grades:                                              |              |               |
| Basic .....                                                        | 739,613      | 953,627       |
| Bessemer .....                                                     | 29,052       | 31,388        |
| Foundry and malleable .....                                        | 145,110      | 184,242       |
| Total production .....                                             | 913,775      | 1,169,257     |
| Exports of pig iron .....                                          | 17,307       | 23,304        |
| Exports of ferro-alloys .....                                      | 9,238        | 22,802        |
| Imports of pig iron .....                                          | 47,482       | 58,130        |
| Imports of ferro-alloys .....                                      | 13,758       | 14,777        |
| Steel:                                                             |              |               |
| Production of ingots and castings.                                 | 1,020,396    | 1,428,249     |
| Production of ingots by classes:                                   |              |               |
| Open hearth .....                                                  | 962,411      | 1,377,387     |
| Bessemer .....                                                     | 19,448       | 1,416         |
| Electric steel .....                                               |              | 17,939        |
| Other steels .....                                                 | 7,970        | 961           |
| Direct castings by classes:                                        |              |               |
| Open hearth .....                                                  | 28,384       | 23,496        |
| Electric .....                                                     |              | 1,700         |
| Other castings .....                                               | 2,683        | 5,350         |
| Electric steel, total production ...                               | 5,625        | 19,639        |
| Imports of steel ingots, billets and blooms from United States.... | 58,486       | 118,070       |
| Production of steel rails .....                                    | 232,411      | 90,123        |
| Production of wire rods .....                                      | 124,381      | 179,226       |
| Imports of wire rods .....                                         | 71,839       | 66,166        |
| Imports of tin plate .....                                         | 45,165       | 57,543        |
| Value of total exports of iron and steel goods .....               | \$48,268,148 | \$63,837,681  |
| Value of total imports of iron and steel goods .....               | \$74,308,983 | \$129,090,168 |



## DEVELOPMENT OF NICKEL REFINING PROCESSES.

By V. N. Hybinette.

Evidence of Mr. V. N. Hybinette, of Kristianssands, Norway, Before Ontario Nickel Commission, London, England, 4th April, 1916.

It may seem to you at the beginning that I am taking you too far back, but to show you just how it all came about, I shall start at my old home town, Falun, in Sweden. There they had what were in olden days the largest copper mines in the world. About 1875 they stopped their old smelting business, and introduced the Henderson process of chloridising roasting and leaching for their copper ores. Only a few miles outside this town of Falun was one of the biggest, perhaps the biggest, nickel mine in Sweden. This nickel mine was at Slattberg and the nickel works were at Sagmyra, near by. Shortly after the Franco-Prussian war these mines were bought by some German interests which probably controlled the nickel refining business of the world at that time. That old mine was in the '70's producing copper-nickel matte by smelting, like all the other Swedish mines in these days; there were four or five of them, all smelting a very low-grade matte and treating that low-grade matte with sulphuric acid so as to obtain sulphate of iron as a by-product. The sulphuretted hydrogen was taken into chambers and made into sulphuric acid. The residue, containing sulphide of copper and nickel, was sent to Germany as such. In the middle of the '80's when I started as apprentice at the copper works in Falun, Mr. Hendrik Munktel, also owner of the world-famous Grycksbo paper mills where the Swedish filtering paper is made, was the general manager of these old copper works which were using the Henderson process for chloridising copper ores. Henderson was manager of the Tharsis works in Glasgow in those days—the '60's and '70's. The Germans had stopped working the nickel ores at Sagmyra when the New Caledonian ores were found, and the plant had been shut down for more than ten years, when it occurred to Mr. Munktel that the Sagmyra ores might be treated by chloridising roasting; and my first employment in the nickel industry was to make a series of experiments beginning on a small laboratory scale but afterwards enlarged, with chloridising roasting of copper-nickel ore, extracting the copper and nickel with water and acid, and afterwards refining that solution in one way or another. It would take me too long to go through all that. In those experiments we met with so much success that Mr. Munktel, who was a rich man, got some other people with him and established works with this process at Hommelvik, in Norway, where they used nickel ores from different mines in Norway, which were considerably richer than the Swedish ores. We started building in 1887, and were able to produce nickel in 1889, 1890 and 1891. I was the superintendent of these works, and the processes had all been worked out by me. But the production at the best amounted only to 50 tons a year. In those days we were being paid 80 cents a pound for the nickel. Practically all the nickel was sold to a gentleman whom you will probably see when you get to Sheffield tomorrow, Mr. Doncaster.

Q. I know him well—Samuel Doncaster? A. Yes, he was part owner in those works, and he visited them and he knows me very well. We were getting through our troubles in that plant and beginning to make some money, although in the meantime nickel had gone down to about 60 cents a pound, when one day in the

autumn of 1891 we read an article in the "Engineering and Mining Journal" to the effect that Col. Thompson, the president of the Orford Company, had made a contract with the United States government to supply them with a million dollars' worth of nickel at the rate of 30 cents a pound, and this was at a time when we were getting from 60 to 80 cents a pound. I advised my friends to shut down their plant, which they did in the spring of 1892, and I went over to America to see what the Orford Copper Company were doing. When I arrived there, I found that they had been experimenting off and on for several years with the nickel contained in the copper matte which they got from the Canadian Copper Company's little smelter at Copper Cliff. The matte was originally treated as a copper matte and no payments were made for nickel, and the Orford Copper Company did not save it. However, in 1890-91, they experimented with a process which seemed to promise to be of some use, and it was on the strength of that process that Col. Thompson made this contract. In this process the Bessemerised matte was treated with sulphuric acid so as to dissolve out the nickel as sulphate.

Q. Was that after roasting? A. No.

### Working Up the Orford Refining Process.

Q. The raw matte? A. Yes. The copper sulphide is very hard to dissolve; the nickel sulphide dissolves easily, and by not roasting the matte, it was possible to obtain a nickel sulphate free from copper. The solution so obtained was boiled down to dryness and the crystals roasted, whereby nickel oxide was produced, and this was delivered to the United States government on account of the contract. It was soon found, however, that they were not able to get anything like all the nickel dissolved in that way. The process was very costly, and Col. Thompson found that he had made a bad bargain. If they could not invent a new process in a hurry to make nickel at 30 cents a pound when the market price was 60 cents a pound, they would not be able to fulfil their contract. So they started looking up all the old patents, papers and metallurgical books, and particularly the patent descriptions of the United States Patent Office. They found one, which for some reason or other took their eye, invented by an old brass smelter in Torrington, Connecticut. I do not know whether you are aware of it, but there is some copper-nickel ore there. This process consisted of melting copper-nickel matte with soda salts, whereby copper sulphide and sodium sulphide formed the top, and nickel sulphide formed the bottom. I might state here that this separation of nickel from copper was known in Europe and in use many years before the Orford Copper Co. took it up. The patents granted to Bartlett, John L. Thompson and R. M. Thompson are for production of a commercially pure nickel by repeated smeltings with soda salts, whereas the old processes only used the reaction for removing the bulk of the copper. When I arrived in New York in the spring of 1892 the Orford Copper Co. had just got that process perfected in such a way that they were smelting their matte with nitre cake four or five times and obtaining a nickel sulphide containing over 70 per cent. nickel, 1 per cent. arsenic, some antimony, at least 1 per cent. iron and 1 per cent. copper as the principal impurities.

Q. Was that from the Sudbury ore? A. That was from the Sudbury ore. They had a contract for refining all the material that the Canadian Copper Company could give them. The armor plate makers soon found out that to make a good armor plate they had



to have better nickel, consequently the United States government required the nickel oxide to be free from arsenic, and the copper content was not allowed to be above 0.25 per cent. I was able to show them how to get rid of the arsenic by a small change in their ordinary practice, and as a reward for that I was engaged in the company's employ to build a plant to make metallic nickel. I built that plant in the spring of 1893 at a place entirely separate and about two miles distant from the main works of the Orford Copper Company. In the meantime I had been allowed to study the metallurgical practice of the Orford Copper Company, and on account of the experience I had obtained in Norway, I saw how I could greatly improve upon their metallurgy. However, nothing was done until 1895, when the specifications for nickel became stricter, and it became impossible to sell nickel oxide for armor plate containing more than 0.15 per cent. copper, which quality it was impossible to obtain by the top and bottom smelting, at least in an economical way. They were then repeating their smeltings with nitre cake from 7 to 9 times. In my work with the Henderson process at the plant in Norway, I had found how differently the copper and the nickel behaved when they were being chloridised in a roasting furnace, and it occurred to me that it would be much easier to extract the last trace of the copper by chloridising roasting and leaching instead of by this top and bottom smelting.

As I said, it was in 1895 that I was allowed to demonstrate and introduce this process at the Orford Copper works because they had been unable to find anything else that would save the situation. I could just as well have done it in 1892, but they would not let me, as there was a great deal of jealousy about it. When my scheme proved successful, I was given charge of the nickel department. Later on, in 1897, when I was given complete charge of the whole nickel industry of the Orford Copper Company, I was able to carry out my system in a more finished way, so that it became what it is now, the Orford process, which consists in top and bottom smelting repeated two or three times, leaching with water of the pulverized bottoms, followed by leaching with weak acid to remove sulphide of iron and incidentally also cobalt, and finally two treatments by chloridising roasting and leaching. These two treatments are so carried out that you chloridise the sulphide and leach it, and the resulting nickel oxide is mixed with nitre cake and salt, then roasted and leached, whereby the copper contents of the nickel oxide are reduced to only a few hundredths of 1 per cent.

When I had introduced all these improvements I was promised by Col. Thompson to be taken in as a partner, but unfortunately at the time he was selling out and rearranging his affairs I was taken ill with malarial fever, so that I was practically useless for two or three years. When I came back to health again I found that the International Nickel Company was formed, and that I had been allocated a very insignificant proportion of what I had been promised. This to a great extent was simply due to the fact that I had been ill and that nobody had thought I was going to recover. If I had been strong and healthy, I suppose I would have been able to hold my own—a little better than I did, at least. You can understand how I had had to work during the years I had charge of the Orford works. I was practically the only scientifically educated engineer with the Orford Copper Company and the Canadian Copper Company, and I had had single-handed to change the process and at

the same time increase the production from 200,000 or 300,000 pounds of nickel to 1,000,000 pounds a month. This I did inside of three years, 1897-1900, without at any time stopping the works, by simply adding to and changing them around in the best way I could, and in addition without any particular appropriation of money to do it with.

Q. All the time I suppose you were adapting the old works to your requirements? A. Yes, that was it. Well, when I had the Orford process as well developed as I thought I could get it, in the year 1900 it seemed to me that it was not without its faults; the quality of the nickel was not as good as that of New Caledonia; the number of processes that the material had to go through made it utterly uneconomical, not to say impossible, to work on a small scale. The only reason that the process is economical is that it is carried out on so large a scale by the International Nickel Company. It is, however, a tremendous improvement upon the nickel processes which existed before 1892, and upon all others that had been invented in the meantime.

#### **Invention of Electrolytic Method.**

I concluded in about the year 1900, or perhaps 1899, that the only correct way to handle the problem of separating nickel from copper was to make the matte into an anode, electrolyse that anode and obtain the nickel at the cathode directly; and I set out to solve that problem. I did solve it in a laboratory way at the time, and informed Col. Thompson of the fact; but inasmuch as he was not the owner of the mines and smelters, and had simply a short time contract for refining, he did not consider that he could afford to change the whole of his plant. Consequently nothing was done. But in 1904, while I was in the employ of the International Nickel Company as their metallurgical engineer, I informed Mr. Monell of the existence of this process, and he agreed with me to give it a trial and promised that I would get a certain payment in case it was accepted. A plant was built for electrolytic refining in the summer of 1904 at the Orford works, but just as it was about to be started, or just as it was started, and I had shown my ability to produce nickel in that way, I was ordered to patent the process in the name of the Orford Copper Company and hand the patents over to them without any payment. This was entirely contrary to the original agreement, and I had no other course than to leave the company's employ. I was shortly thereafter asked to build a plant for the Lake Superior Corporation which owned some nickel mines in the Sudbury district, but—I do not know what to say—through the peculiar feelings of some of the directors, the board of directors could never be made to agree to build a plant, and after having spent almost a year in negotiations I had to give it up. I then got together some very rich people in New York more or less affiliated with what is known as the "Standard Oil crowd," and took an option on some mines and began to prepare for the building of a plant; but just then some of the directors in the new company found that they had friends who were interested in the nickel business with whom they would not care to compete, and therefore I was told that they would not go into it. This adventure had lost me another year.

#### **Tried at Fredericktown; Installed at Kristianssands.**

After that I got an offer to go down to Missouri and build a plant for treating the complex ores of the North America Lead Company at Fredericktown. I never thought that their ore bodies amounted to very



much, neither could I see that their chances of ever becoming a large factor in the nickel business were very good, but I thought that it would be a way of introducing my process for separating copper and nickel on a large scale, and I therefore accepted the proposition. To make it go through I had to put up a great deal of money, much more than I could afford, out of my own pocket. I went down there, and in the years 1906 to 1909 I worked out and started the process which, as far as the metallurgy went, was successful. Not only was I able to separate the copper and nickel, but also to separate out in a novel way the large quantity of cobalt that was present in those ores.

Q. Do you happen to remember the assay of that ore? It is only a matter of general interest, but the relative amount of nickel and copper would be important? A. It was a lead ore in limestone which, together with the galena contained a nickel-cobalt mineral called linnaeite, and also some chalcopyrite. The values in copper, nickel and cobalt varied very much, but in concentrating the material in the ordinary wet lead concentrating-mill a middling was obtained containing, outside of fairly large quantities of lead, about 4 per cent. copper, 2 per cent. nickel, and 1 per cent. cobalt. This was the raw material for my process. The process worked well, and we were making money when I was suddenly notified that the board of directors would not carry on the work any longer, and they shut the place down without any good reason. In the meantime I had been approached by my old friends in Norway who were interested in using my process in that country. They sent their engineers to Fredericktown to inspect the copper-nickel part of the plant, and upon receiving a favorable report from these engineers the Norwegians made a contract with me for building the plant at Kristiansands in Norway. To define the state of perfection of the process at that time, I will say that the original plant at the Orford works had been designed for a material containing two parts of nickel to one part of copper, but it was used for so short a time that I was unable to learn anything from that installation. The new installation in Fredericktown had necessarily to be made in a different way—only the main principle was the same—on account of there being so much more copper and so much less nickel, and particularly on account of the presence of considerable quantities of lead and cobalt. When it again came to handling the material in Norway there were other considerations, such as the high price of coal and cheap electricity, which made it necessary to again change the process. But although the first plant put in in Norway could in consequence be said to be an experiment, it worked very satisfactorily from the beginning. It had only been operated for half a year when it was concluded to double its capacity. It was started in 1910; the capacity was doubled in 1911 and 1912, and again increased in 1914, so that the capacity at the present time is about 1,800 tons of nickel per year.

Q. And copper? A. 1,200 tons.

Q. And precious metals—do you take much notice of those? A. Oh, yes.

Q. Can you tell us anything about them? A. Well, the ores vary very much, just like they do in Canada.

Q. I suppose the palladium would be more than the platinum, as it is in the Canadian ores? A. Yes.

#### Refining Operations in Norway.

Q. What is the cost of erection of the plant? A.

The actual cost of the plant, as it now stands, with a capacity for 1,800 tons, was about \$250,000.

Q. That 1,800 tons is nickel? A. Yes. We are not using it to that capacity now, on account of our inability to obtain raw material during the war. We are only operating the plant to half its capacity.

Q. Is that entirely on Norwegian ore at the present time? A. Entirely on Norwegian ore.

Q. From the two mines? A. Yes.

Dr. Miller—By raw material you mean the ore? A. Yes.

Chairman—And matte? A. Yes, and scrap. We bought a good deal of German silver, scrap and turnings, and things of that kind. The refining plant, where we used bessemerised matte, is built very cheaply, perhaps a little too cheaply; it is a wooden structure. It is doing the work, however, and the actual cost of refining is in ordinary times, not figuring on war prices, between 100 and 110 per ton of nickel.

Q. Does that include roasting of the matte and the making of anodes and everything? A. Yes.

Dr. Miller—That is the total cost? A. From the Bessemerised matte to nickel cathodes, electrolytic copper ingots and precious metal slimes. There is no cost on the copper, all the cost is figured on the nickel.

Q. What is the ton? A. It is the metric ton.

Mr. Young—2,204 lbs? A. Yes. We have demonstrated these cost figures to the satisfaction of Mr. J. E. McAllister, of Toronto, Mr. W. A. Carlyle, of London, Mr. W. R. Deacon, of New York, and several well known American engineers.

Dr. Miller—If you were working on a larger scale, as you hope to do, in Canada, they would probably be reduced? A. Yes. The material that we are using is 6 to 8 tons of coal per day, a few tons of coke for smelting the anodes, and about 1,800 horse power of electricity for making these 1,800 tons of nickel per year. This power consumption includes blowers, elevators, lighting of plant and so forth.

Chairman—How would your electric power costs compare with those in Ontario at say 15? A. We are paying at present 45 crowns, which is practically \$12—we are practically paying \$12 per horsepower year, for high voltage current delivered at the refinery.

Mr. Gibson—What does your coal cost? A. Our coal in ordinary times costs us between 18 and 20 crowns per ton delivered at the refinery. This is about \$5 a ton.

Q. And your coke? A. Coke costs \$7 a ton.

Q. Are these long tons? A. Yes; and we have about 100 men employed in three 8-hour shifts, paying them an average of 13 cents per hour.

Chairman—Could we say that throughout the information you give us you are always speaking of the metric ton? A. Yes. Of course the coal and coke which comes from England is different.

Q. It really would not make much difference? A. No.

Mr. Young—It is 36 pounds difference per ton, I think.

Chairman—We have descriptions of your process in Dr. Coleman's report. Could you give us one which we could publish as your own description, giving what details you thought best? A. The process is thoroughly described in its main features in the patents which have been granted to me in the United States and Canada in the years about 1905 and 1914-16.

Chairman—There were two taken out very recently, were there not? A. There were four taken out on



the main improvements which we have introduced during our work in Norway.

#### Method Suitable for Ontario Ores and Conditions.

Dr. Miller—Is there any reason whatever why this process of yours, which is in successful operation in Norway, cannot be put into practical operation in the Province of Ontario? A. There is absolutely no reason. The ores which we are working, Norwegian ores, give us on an average 1.0 per cent. nickel.

Chairman—Does that mean recovery? A. Yes, yield. None of the mines is worked at a greater rate than 100 tons a day. The process consumes absolutely no chemicals whatever.

Q. Of course that would be a great advantage to us? A. I mean, outside of lead for linings of tanks, and firebricks and ordinary repairs of furnaces.

Q. And as regards waste liquors and that sort of thing? A. There is none. The solutions are automatically regenerated, so that the main solution with which we started in Norway five years ago is the same one today. It has never deteriorated at all. Of course we have had to make some more, and we have it in our power automatically in the process to obtain an increased bulk of such solution, so that when we have increased our plant we have automatically increased the bulk of the solution.

Mr. Young—And there is nothing noxious or harmful or offensive in the process? A. No. The same workmen who were with us when we started are still with us, and they are in a good, healthy condition.

Q. And there is nothing to hurt outsiders? There is no discharge? A. No. We are in a fine garden district, and we have had to put up a 150-foot high chimney for the sake of getting rid of the sulphurous acid which results from roasting the matte.

Chairman—When you are preparing your anodes, you roast to a certain point, I suppose? A. Yes.

Q. But there is no trouble with a reasonably high chimney? A. No.

Dr. Miller—Could not the making of the anodes be done at the smelter and the anodes shipped to your works? A. Yes, or the roasting can be done at the smelter, and anode melting done at the refinery.

Q. No sulphur would be given off? A. No, at least only an insignificant amount.

Mr. Gibson—Do you roast your ores in the open air in heaps? A. No, we do not roast them at all. All the sulphur which comes off comes off in the bessemer converters.

Mr. Young—You were saying that you were in a garden district? A. Yes.

Q. A populous district? A. Yes.

Mr. Gibson—Do you have any appreciable losses as between the contents of the ore and the recovery? A. Our slags contain on an average 0.15 per cent. nickel and 0.1 per cent. of copper.

Q. You said you had 1.0 per cent. of nickel recovery, but you did not mention the copper recovery. A. That is about 0.7 per cent.

Q. With the richer ores at Sudbury the percentage loss would be reduced? A. Yes.

Chairman—Your total losses per ton of ore would be practically the same as in Norway, and therefore proportionately less? A. Yes.

Mr. Young—How does the cost of labor compare in the two countries? A. It is cheaper in Norway. We are paying our workmen 13 cents an hour on an average, working 8-hour shifts. You have to pay about double, I suppose?

Q. Easily. A. A plant making two or three times as much as we are making in Norway, would only need 50 per cent. more labor, so that when we are working on a larger scale that will even itself out.

Dr. Miller—Your mining costs would be lower? A. Yes, very considerably lower. Our mining costs are about \$2 a ton of ore, whereas we do not expect it will cost anything like that, not much more than half of it, in Canada. Our smelting costs are about \$2 a ton of ore, and that can also be decreased very considerably when working on a larger scale.

Mr. Gibson—Why do you expect the cost of mining in Canada to be less than in Norway? A. On account of the larger ore bodies.

Q. Notwithstanding the fact that our labor is much dearer? A. Yes.

Dr. Miller—You said you were mining not more than 100 tons a day from the larger mine? A. Yes.

Mr. Young—In taking your costs from the books do you distribute the overhead charges? A. Yes.

Q. Over the whole? A. We have a cost-sheet which will be laid before you, which shows the whole costs divided up into some 20 or 30 heads, beginning with freight to the plant, then the weighing in, the crushing and sampling, the roasting and anode smelting, electrolysis, copper refining, steam generation, precious metals, recovery; and such charges as superintendence, office keeping, taxes, insurance, selling expenses, and so forth, each item by itself figured out per ton of nickel.

Chairman—That answers quite a number of little points I had intended to ask you.

Mr. Young—Does the Government audit check your costs? A. Yes.

Q. As well as your general expenses? A. Yes.

Mr. Gibson—Does your company publish a printed report for the information of shareholders? A. No, we do not. We do not publish anything. We have our annual meeting at which we read a report behind closed doors to stockholders only, with instructions to keep it to themselves; and the printed report which is given out is not supposed to be any better than the one which the International Nickel Company is publishing.

#### Details of Process.

Chairman—Could you give us any particulars—we have got them from the other companies and it would be convenient if we could get them from all—as to the analysis of the ore, of the matte, and of the metallic nickel and metallic copper—anything that you would probably like to be published? It would make the whole thing on all-fours. A. The ores from the different mines vary very much. Taking the whole smelting mixture, I would say that the ore analyses 1.3 per cent. to 1.4 per cent. of nickel and about 0.9 per cent. of copper; it contains in one smelter 20 per cent. of sulphur, 35 per cent. of iron, and 35 per cent. of silica.

Q. Would that mean real silica—or what we call siliceous matter? A. Real silica, and the rest, lime, alumina and magnesia. The blast furnace slag which we throw away contains on an average 0.15 per cent. nickel and 0.10 per cent. copper; and the Bessemer matte which we produce contains about 50 per cent. of nickel and 30 per cent. of copper. The main thing about the bessemerised matte is that we bessemerise it to contain about 0.5 per cent. of iron.

Q. That is almost identical with the Canadian practice, is it not? A. Yes.

Q. And the reason for that, I presume, is to avoid the excessive loss of nickel which occurs if you carry it



beyond that stage. Is that so? A. Well, you cannot carry it beyond that stage.

Q. You cannot get rid of any more sulphur? A. You cannot get rid of any more; that is the utmost limit. It is very hard to get that, because it freezes. The bessemerising cannot be carried any further, and there is no use in carrying it any further. Of course it might be a nice thing if you could get it down to 0.1 per cent. or 0.2 per cent. of iron, but it does not matter.

Q. I was thinking more of getting rid of the sulphur for the manufacture of anodes. A. You do not want that for other reasons. There are ways and means of getting rid of that sulphur easily enough. We really do not want to go any further. We do not want to get rid of that sulphur.

Q. But in making your anodes, could you use those containing as much as 20 per cent. of sulphur? A. Yes, but they would be so brittle that they would not last so long. There is no chemical reason why you could not, but there are practical reasons such as brittleness of the anodes, and bulkiness, and so forth.

Q. Did you give us the assay of the nickel? A. I was going to give you the assay of the nickel.

Q. We have got so far as the matte now? A. Yes, the nickel can be produced without any chemical difficulty up to 99.9 per cent. pure. But for practical and commercial reasons, there is no use in going to such a high grade, and therefore we are only producing a quality that is competing favorably in the market. We have never since we started had any complaint against the quality of the product.

Mr. Young—If the market called for pure nickel, you could meet the demand with your process? A. Yes.

Chairman—Could you guarantee it free from copper? A. We can make it down to 0.01 per cent. or 0.02 per cent. of copper, but we are not making it down to more than about 0.1 per cent. because the market does not call for anything purer. We could make it practically free from iron, but we are leaving about 0.50 per cent. of iron in it.

Q. And cobalt, I presume, goes in and is called nickel? A. Yes, any cobalt that stays in the bessemerised matte goes in with the nickel, but in bessemerising, when you get rid of the iron you lose the bulk of the cobalt also. The nickel which we produce is guaranteed to contain less than 1 per cent. of cobalt, but it very rarely contains more than 0.50 per cent.

#### Marketing Nickel in Germany.

Mr. Gibson—Where is your market for the nickel? A. We are selling our total output on a long time contract to Germany. It was sold by the German company before the war in England, Italy and Russia, but is now going exclusively to Germany and Austria.

Q. Has nickel materially increased in price since the outbreak of war? A. Yes, but we have not had any very particular benefit from it.

Q. By reason of your long-time contract? A. Yes.

Mr. Young—That is hard luck? A. Yes.

Q. Did I hear some gentleman at one time say that there was an objection to the electrolytic process in operations of any magnitude—that as you get handling enormous quantities of ore the electrolytic process is not so adaptable as with a smaller quantity? A. I can tell you something about that. I heard it today from Mr. Dunn. A short time ago some large

financial interests in New York were asked whether they would help to finance the British America Nickel Corporation, and without any further thinking over if it would be advisable, they went right to the International Nickel Company for information and were told that they knew my process very well, which they do not. They were also told that although they admitted the process was worked on a very small scale in Norway, it was so intricate chemically and had so many operations that it was impossible to work it on a large scale. I would say that it was just the other way round. The Orford process is many times as intricate as the present electrolytic process. Half a dozen world-renowned engineers who have seen the plant at Kristiansands have never for one minute doubted it could be carried out on any scale whatsoever.

Mr. Young—It is only fair to say that those remarks, as I understood them, were not directed to your process, but were made in the course of discussing the electrolytic processes in general. A. Yes.

Mr. Gibson—Do you know of any climatic difficulty in working your process in Ontario? A. No.

Q. Would it be workable in the Sudbury district? A. Yes.

Q. There would not be any difficulty in the way of extremes of cold and so on? A. No. I have installed an equally intricate electrolytic process in the north, where they sometimes have 50 degrees below zero.

#### Recovery of Copper and Precious Metals.

Chairman—You have not given us the composition of the copper. Do you melt that down, or sell it as precipitate? A. The copper is recovered as cement copper, together with the precious metals, and the cement copper is melted down to anodes which are electrolytically refined.

Q. By you? A. Yes, by us. It is carried out exactly in the same way as the ordinary electrolytic refining of ordinary copper material, whereby we get the electrolytic quality of copper equal to any on the market.

Q. I suppose you sell the anode mud containing the precious metals? A. Yes.

Q. You do not smelt that? A. No.

Q. That is just the same as the ordinary electrolytic blister copper practice? A. Yes.

Q. Do you make any nickel salts or copper salts? A. No.

Q. No oxide—nothing but the metals? A. No. We can if we want to, but so far we have not. But that again would involve consuming sulphuric acid, which we naturally could produce ourselves.

Mr. Gibson—Do you make any use of the sulphur at any stage of the operation? A. We get automatically in our process enough sulphuric acid in the roasted material to supply us with whatever sulphuric acid the process needs.

Q. Is that a considerable quantity? A. No, it is a very small quantity.

Chairman—It comes from the oxidation of the sulphur in the anodes? A. Yes.

Mr. Gibson—That is converted into sulphuric acid? A. It is automatically, without doing anything to it, worked into sulphuric acid in the process.

Chairman—How do you precipitate your copper as precipitate? Is that from the solutions from the electrolytic deposition of the nickel? The mother liquor will contain the copper? A. No. My electrolytic pro-



cess consists mainly in that you have a large quantity of nickel sulphate solution which is all the time circulating in the plant between the nickel depositing department and the copper depositing department. In the nickel depositing department the anodes are dissolved whereby both copper and nickel go into solution. Only nickel is deposited, and the solution carrying the copper is pumped over into the copper department where cementation on slabs of metal identical with the anodes takes place; the copper is deposited as cement copper, and the nickel dissolved from the slabs, whereby the solution is made free from copper and returned to the nickel department to take up more copper.

Q. You are managing director of your Company, are you not? A. No, I am not; I am consulting engineer and one of the directors.

Mr. Gibson—Have we the name of your company? A. Kristianssands Nikkelraffineringsverk.

Chairman—We will send a transcript of the shorthand notes to you. A. It might be recorded that the refining does not include any loss whatsoever of copper, nickel, and precious metals except such incidental losses as may occur through leakages and things of that kind.

Q. In other words, all the losses which we have been discussing are those in the production of the matte? A. Yes; and so far as we can analyse, all the precious metals are recovered.

Mr. Gibson—If we have not time to visit Norway, would it be possible to get a copy of your costs of which you spoke? A. Yes, for private information; certified by the official reviser (chartered accountant).

Q. Could we have the items in English so that we can understand them? A. Yes. We have made them up in that way before.

Dr. Miller—You have had some experience in handling New Caledonian ores, I think? A. Yes.

#### Mixing Norwegian and New Caledonian Ores.

Q. Could you give us the cost per ton of the New Caledonian ore? A. I can give you some particulars regarding the treatment of New Caledonian ore. The New Caledonian ore is in a metallurgical sense different from the Canadian or Norwegian ore, in that it is practically free from copper. Heretofore the main cost of refining has been in the separating of nickel and copper, and the refiners of New Caledonia ore have therefore taken great pains not to introduce into their furnace charges any material containing copper. The New Caledonian ore is so composed that it requires a great deal of fluxing, and, inasmuch as practically all available iron fluxes contain some copper, the fluxing of the New Caledonian ores has heretofore been done by using limestone, gypsum, fluorspar and the residues from the Leblanc soda process. This, however, has had its effect on the cost of making nickel from New Caledonian ore, inasmuch as it has been impossible to treat the ore unless there were quantities of cheap fluxes to be had. And even at that with the cost of fuel, the large quantities of flux and the nature of the mixture, the fuel consumption in smelting New Caledonian ore has been very large. My electrolytic process for separating nickel from copper is so cheap that the old objection to introducing the copper is no longer good, particularly as the ores generally contain a certain amount of precious metals, which pay part if not all of the refining costs. We have therefore lately started the practice of mixing

our Norwegian ores with New Caledonian ore, and it has been very successful. No barren fluxes whatsoever are necessary. The fuel consumption, on account of the presence of iron and sulphur, is very low. The slag we obtain is of such a composition that the nickel content thereof is surprisingly small. The ore from our mines can be mixed with New Caledonian ore without briquetting, which is usually done in the ordinary practice of smelting New Caledonian ore. So far as we have been able to find out, we are able to treat the New Caledonian ore in this way cheaper than by the ordinary present practice.

Chairman—Could you tell us what the amount of iron is, and the general composition of the New Caledonian matte as sent over—the first stuff is about 45 per cent. of nickel, I believe—and how much iron that contained? A. The New Caledonian matte that now comes on the market is partly produced by electric smelting, whereby the objections which I just mentioned to a great extent fall away. But the trouble is that electric power in New Caledonia can only be had in very limited quantity. There is a ferro-nickel produced called matte; we have had some of it; it varies very much in composition.

Q. Would it contain a great deal of sulphur—say 20 per cent.—or more, or less? A. We have had some that really was a matte, and we have had some that really was a metal. From the little experience we have had from buying material from them, I would say that they have not yet got on to a settled practice of production; but I may be wrong in that.

Dr. Miller—There are one or two questions I should like to ask. I started to ask you what the cost of New Caledonian ore is, laid down in Norway? A. I thought you meant treatment. Well, that varies very much, because the freight charges vary enormously. Under ordinary conditions we can get the 5½ to 6 per cent. ore laid down in Kristianssands for about 11 cents per pound of the nickel contents. That would be about the average price, which I think is about the same price as here in England.

Q. Ordinarily, that ore will run to about how much of nickel? A. 5½ to 6 per cent.—between 5 and 6 per cent.

Q. Have you any idea of the cost of refining it by the methods employed by the French company and its branches? A. No, I do not know, but I can make a good guess. I suppose I should say about 6 cents per pound of nickel.

Q. This would mean the total cost of refined nickel from New Caledonian ore about what? A. Say 17 to 18 cents per pound.

Q. What is the cost of refined nickel by the Mond process? A. It may be as much as 15 cents per pound.

#### COAL MINERS HOLD OUT.

Calgary, June 4.—Despite rumors to the contrary, the miners are determined to back up the action of their Policy Committee in the district fight with the International Executive. Over the week-end a vote was taken, and every camp, including those of Taber and Lethbridge, from which reports of friction between the officials came, voted its approval of the Policy Committee's action in standing out for the 30 per cent. increase. This proves the district officials' judgment that the men would not return to work unless their demands were met.



### SOME CANADIANS IN ENGLAND.

The accompanying photograph will interest many of our readers, for the faces are familiar ones. The men standing are: T. M. Montague, W. W. Ritchie, James Bartlett, A. D. Macdonald, Tom Code and the Instructor. Those sitting are: V. M. Meek, M. C. H. Little, J. Stevenson, R. H. Dickson and Clayton R. E.



Officers Class in Mine Rescue Work, April 6th, 1917, Royal Engineers Barracks, Chatham, Eng.

### TIN PLATE.

Commenting on the tin plate situation the "American Metal Market" says:

"The production of tin plate is very heavy. Prior to 1915 it was a good year indeed that approached 1,000,000 gross tons of output. This year's output promises to be in excess of 1,500,000 tons. Exports at present are running lighter than last year, through the patriotic action of the mills. Tin plate production is also light, and taking into account the diversion of shipments towards the perishable food crops as well as the accumulations, it is hardly a wild guess that the supplies of cans for the perishable food crops this season will be something like double the average of the best previous years."

"There is reason to expect a tremendous pack of the perishable food products this summer and fall, judging by the supplies of tin plate that are being furnished for the purpose. The food packers who make their cans and the can makers who sell to the food packers took very heavy shipments between seasons, as there was tin plate due them on 1916 contracts at prices very far below what could be done for the present season, these contracts being at \$3.50 to \$3.60, while prices for the first half of the present year were \$5.75 to \$6.00 and for the second half of this year \$7.50 to \$8.00."

"For nearly two months past the tin plate manufacturers have, upon request of the authorities at Washington, been shipping particularly large quantities of tin plate for the perishable food products, to the curtailment of shipments to other consumers. Even up to this

date the diversion continues, and with the present outlook it is likely to continue until the end of the canning season, or into next September."

In spite of the greatly increased production of tin plate, the demand still far exceeds the supply and those who can get along with substitute containers are being asked to do so. U. S. Secretary of Commerce Redfield says of means of conserving the supply:

"The greatest saving in tin plate can be effected by using substitute containers for non-perishable goods, and the U. S. Bureau of Foreign and Domestic Commerce has prepared suggestions along these lines. Many familiar articles which are put up in tin containers can well be put up otherwise. Substitutes are now in use for packing tobacco, coffee, tea, spices, baking powder, soap powder, white lead, powdered paints, syrup, cocoa, cheese, lard, butter and peanut butter."

### TANTALUS MINE LEASED.

Whitehorse, Yukon,—J. P. McAbeer of Tacoma, Wash., for the past six years superintendent of Tantalus coal mines, has leased the property and will work from 12 to 15 men there this summer, the amount of output to be regulated by the facilities for transportation, which are limited. With the exception of a small tonnage taken by the W. P. & Y. R. at Whitehorse the entire product of the Tantalus mine is readily sold in Dawson. A great deal more coal could be disposed of in that city if boats or barges were to be had to transport it.

Mr. McAbeer intends to make several important changes in the methods of working the mine and in the handling of the product. Among other things he will put in a washer and screening plant, and Mr. Wright, representing the Jeffrey Manufacturing Co., of Columbus, Ohio, will arrive shortly to take charge of the installation of these and other improvements contemplated in the 3000 feet of underground workings.—Weekly Star.



**HEDLEY GOLD MINING CO.**

The annual report of Mr. I. L. Merrill, of Los Angeles, president of the Hedley Gold Mining company, is as follows:

During the past year everything at the mine and mill has gone along fairly well. I think we have opened about as much new ore as has been extracted, but am disappointed in the grade of this new ore. The average grade of our reserve is now about \$9 per ton. We plan to do considerable development this year at the mine, and hope to open more higher grade ore. The mill construction is completed. The continuation of the war has kept our operating costs very high, and we will be forced to mine a little higher grade of ore than the mine average until supplies, etc., get back to about normal again.

Mr. Gomer P. Jones, general superintendent, reports: For the year ending December 31, 1916, your mill at Hedley, B. C., has treated 73,491 tons of ore, all mined from the Nickel Plate property, but very little development work other than the opening up of ore bodies within already estimated boundaries has been done. This work was necessary so that a more uniform grade of ore could be maintained. In doing this it was proven that in some sections our estimate of reserve in 1915 report was below the actual tonnage available, while in other sections it was greater, consequently our estimate of tonnage in this report has been revised.

The main reason for the small amount of development shown was the excessive cost of material and labor due to war conditions, and should these conditions continue during 1917, the intention is to open up sections of the property where pay ore is known to exist, and by this means we hope to prove up the Sunnyside Nos. 1, 2 and 4 and the country adjacent to the Nickel Plate without interfering with the surplus, as these properties will produce enough ore to pay the development expense, while there is promise of other orebodies being discovered.

The development for the year has proven payable ore to exist to the extreme limit of the workings, drifts and drill holes, and we see no indications of discontinuance of the main ore shoots.

The mill has changed over, so that cyanide precedes concentration. This has been made necessary, as the freight and treatment costs per ton of ore milled was unusually high, due to the increased quantity of concentrate, high freight rate and loss on gold. By the new system the greater part of the gold will be paid for at \$20.67—a gain of \$1.17 per ounce over the former arrangement. The concentrate shipped will be of less value, consequently will take a lower freight rate.

The mill, as arranged is most modern, and will permit of a surplus being made with a lower grade ore than formerly, and a greater surplus with ore of the same grade as now; with normal conditions prevailing the advantage should be very noticeable.

The mill equipment and both hydro-electric plants, steam auxiliary, tramways and all other machinery and plant are in good working order and should need but little repair for some time to come.

Net profits for the year 1916, \$248,617; dividends for year, \$240,000, or 20 per cent. on issued capital. Undivided profits after all dividends were \$443,687. The sum of \$47,475 was expended in making changes in the mill, and it will take about \$13,000 additional to complete the changes. There were 73,491 tons of ore treated during 1916, of an average value of \$10.65 a ton, giving a recovery at the mill of \$711,997, at an expenditure of \$463,379, and net profits of \$248,617.

**HOLLINGER.**

In a statement issued June 8, 1917, N. A. Timmins, president of the Hollinger Consolidated Company, stated that it was not the intention of the directors to pay the dividend which ordinarily would be payable on June 18. Mr. Timmins said: "This decision has been reached after full consideration of the present labor situation, and while the board regrets the decision it feels that the shareholders will recognize that it is the only course to adopt."

Labor conditions, said the Hollinger president, instead of showing any improvement, appeared to be gradually drifting into a state of uncertainty which was most embarrassing to the management and seriously interfering with the carrying on of operations.

The directors were seriously considering the advisability of directing their efforts almost entirely to development work, and thus put the mine in shape to largely increase the output as soon as an adequate supply of efficient labor should be available.

Mr. Timmins stated that the company was operating under the most up-to-date conditions and was more than satisfying the strict requirements for the protection of the men enacted by the Ontario Mining Act, which was everywhere regarded as a model of its kind. As to wages, the amount paid by the Hollinger company exceeded in the aggregate the demand of those who were responsible for the present agitation.

The unrest now so prevalent had been created by a few alien enemies who do not seem to appreciate the liberty they enjoy, assisted by professional labor agitators from the United States, officials of the Western Federation of Miners, who entered Canada notwithstanding the existence of orders against their doing so, and a few Canadians prominent in labor politics.

Mr. Timmins said that there was no intention to close the mine. Operations would be continued as long as a sufficient number of workmen could be secured to carry on, and as long as the company received adequate protection from the authorities.

The Hollinger president added that the mine was in excellent condition, and that the ore reserves had been materially added to since the beginning of the year. It would be unwise for shareholders to part with their stock at the present market price.



The Late Dr. Ludwig Mond.





C. A. THOMAS,  
Resident Manager Yukon Gold Co., Dawson, Yukon.



HENRY S. FLEMING.  
Chairman of the Executive Committee, Canadian Colliers Co.,  
British Columbia.



COL. THOMAS CANTLEY,  
President Nova Scotia Steel & Coal Co.



J. W. BOYLE,  
President and General Manager Canadian Klondyke Mining  
Company.

## LUBRICATION OF ROCK DRILLS.

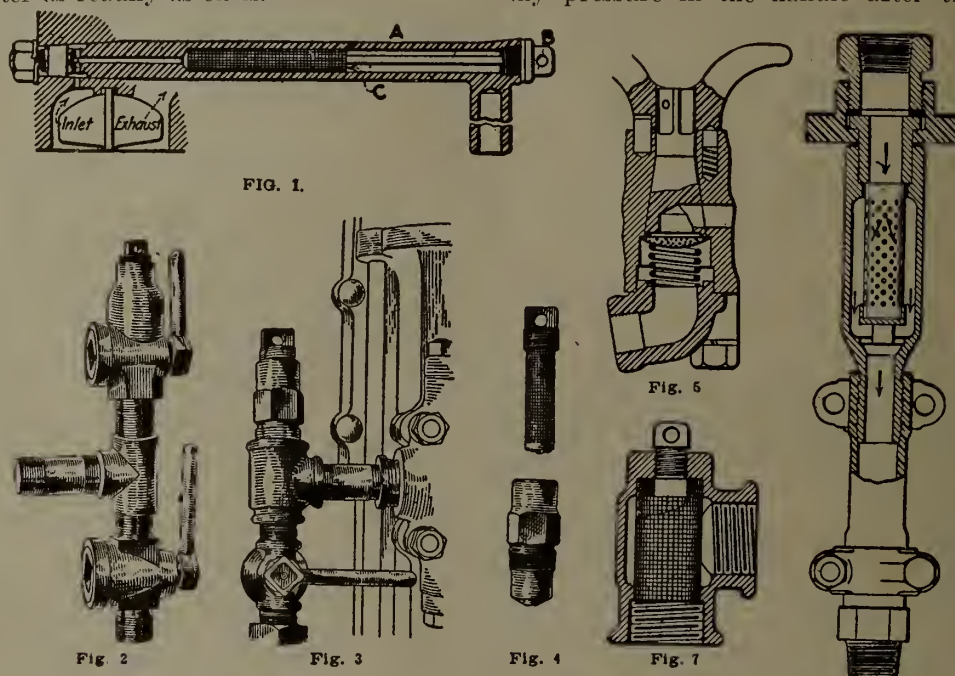
By Charles C. Phelps.

Rock drills are generally regarded as the most "rough and ready" tools in use. They can withstand almost any abuse. As a consequence many drill runners believe that any oil is good enough for lubricating a drill. While it is true that drills will run with almost any kind of oil, it is beyond question that the best results and the least repair costs are obtained only by employing lubricants especially suited to the service. For steam-operated drills a good quality of heavy-body steam cylinder oil is generally found to be most suitable. For air-operated drills, the usual advice is to employ a light or medium-body oil of good quality; however, recent experiments have shown that liquid grease is much better suited for air-operated drills under many conditions of service. This lubricant has been used successfully with both hammer and piston drills, mounted and unmounted types. Liquid grease is particularly valuable for water machines, like the Leyner-Ingersoll, water jackhammer and water stoperhammer, for the reason that it is not washed out by the water as readily as oil is.

plenish the supply until the drill runs dry and, by its poor performance, reminds him that it is time to re-lubricate. One of the best ways to determine whether a hammer drill is getting sufficient lubricant is to notice, when changing steels, whether the shank has oil on it. An operator soon learns to tell when a drill needs lubricant by the dry appearance of the steel shank.

The more modern drills are provided with means for automatic lubrication—features of the greatest practical value. Sometimes the oiling device is an integral part of the drill, and sometimes it is a separate part.

Fig. 1 shows the arrangement for oiling employed with a typical stopper drill. The oil well is in the handle used for rotating the stopper. The hollow handle A fits in a taper hole in the valve chest. In the handle is a porous plug C, beyond which is the oil chamber. Before starting the machine, oil plug B is removed and the chamber in the handle filled with liquid grease. As the machine runs, the pulsations of the air in the supply chamber of the chest draw the oil through the porous plug in the machine. Means are provided to exhaust any pressure in the handle after the air is shut off



Rock Drill Lubricating Appliances.

Liquid grease is a substance that has the appearance of oil and flows similarly, but otherwise has the characteristics and properties of grease. It may be handled in an ordinary oil can and will flow freely through the automatic lubricators on drills. It is made by several of the oil companies. It would be impractical to list here all the various brands which are suitable for air-operated drills, but "I. R. X." Jackhammer and Stoper Grease, (Standard Oil Co.), No. 6 Keystone Liquid Grease, (Keystone Lubricating Co.), "B" Absorbed Oil, (E. F. Houghton & Co.), have been found to give satisfactory results.

The method of feeding is fully as important as the kind of lubricant used. Insufficient lubrication results in slower drilling speed, power wasted in friction, and a more rapid wearing out of parts with consequent higher repair expense. Lubricating too liberally simply increases the oil bill without making any appreciable gain in the operation of the drill. Too often, the matter of lubrication is left to the discretion of the drill runner, who either feeds the oil too liberally or forgets to re-

without drawing the oil out of the chamber. The porous plug serves the double purpose of regulating the flow of oil and straining out any dirt or grit it may contain. A somewhat similar arrangement is used with jackhammers, but in these drills the oil chamber is placed in the side of the cylinder.

If a drill does not embody an oiling device as an integral part of its construction, it can be fitted easily with a special oiler, of which there are several types on the market. In fact, many modern drills are designed to be used with oilers of the external type.

Fig. 2 shows a satisfactory type of external oiler which embodies an oil reservoir of about a half-pint capacity. It is made of malleable iron with a taper plug valve, and is intended for use with either air or steam-operated piston drills. The reservoir is closed with a screw plug. The taper plug has two cups on opposite sides, each holding about a teaspoonful of oil. One cup is always in communication with the reservoir and filled. A half-turn of the handle empties this cup into the supply passage to the drill, and the oil is carried as a spray into



the machine. The other cup is filled ready for another turn of the handle. The reservoir holds enough oil for a half-shift's run, and the handle should be thrown about every 5 to 10 ft. of drilling. The right amount of oil is admitted each time, with no loss of oil or pressure.

Another type of oiler, Fig. 3, is destined to take the responsibility for proper drill lubrication out of the hands of the runner and place it entirely in those of the foreman. It operates by the pulsations of air in the supply pipe near the drill, due to the alternating reversals of the drill piston, and from the nature of its operation has been aptly named the "Heart Beat" oiler. It consists of an oiler body containing a plug carrying a cartridge of wire gauze and an absorbent material (Fig. 4). The body is screwed into a tee, to the branch of which the drill is connected, the oiler coming above the tee and the throttle.

The cartridges are carried in boxes. Three cartridges will suffice for one shift. The drill runner going on shift gets three cartridges from the foreman, and coming off shift, he returns three dry cartridges, which are dropped in a tub of oil and recharged. There is no way of drying the cartridges except by using them in the drill, and the return of dry cartridges is proof the drill has been properly oiled. The oil is not wasted—blown out without doing useful work—but is fed slowly and used to best advantage.

The "Heart Beat" oiler not only enforces proper lubrication of the drill, thus reducing its wear and increasing its capacity, but also economizes lubricant. This type of oiler is intended only for use with air-operated piston drills.

Sometimes drill runners introduce oil through the hose, pouring it in before connecting the drill line to the pressure main, thereby saving themselves the trouble of unscrewing the oil plugs of the drill. This practice cannot be condemned too emphatically, for the oil rapidly destroys the rubber lining used in ordinary hose, and furthermore, it carries into the drill any particles of dirt that may have lodged in the hose.

The remaining important part to be considered in connection with lubrication pertains to grit, dirt and other foreign matter. It is scarcely necessary to mention that the working parts of the drill should be cleaned frequently, preferably with kerosene, and kept well oiled or greased while standing idle.

Dirt must be prevented from entering the drill either with the lubricant or with the compressed air. The former point is taken care of by using a good quality of liquid grease only or oil free from impurities and keeping the supply in a closed vessel. A little grit will do a lot of damage in cutting out cylinders, valves and rotation parts. Small particles of grit and dust pass through the hose, and these must be removed before entering the drill, usually, by an air strainer or filter of some type placed as close to the drill inlet as practicable.

Fig. 5 shows the details of a strainer placed within a stoping drill. This strainer consists of a cup-shaped disk of perforated metal held in position back of the throttle valve by a coiled spring. It has been objected by some that a strainer such as this will result in loss of air pressure. However, tests at various pressures have shown that no reduction in air consumption or loss of power occurs through its use. If the work done by the machine falls off, it is an indication that the strainer is clogged with dirt and needs cleaning. It will be noticed that the air inlet is enlarged at the strainer, permitting an unrestricted flow of air.

Fig. 6 shows another type of strainer, which is principally intended for use on stope drills. The straining medium consists of a piece of perforated metal rolled into the form of a tube. The connection of which this type of strainer is a part should always remain attached to the valve chest when the machine is disconnected from the pressure line to prevent dust from entering the tool while lying idle. Dirt collects on the inside of the straining tube and may be easily removed from time to time by taking the device off the drill and blowing air through it from the end opposite that into which air ordinarily enters. Fig. 7 shows a sectional view of an angle filter, which forms a part of the standard equipment of certain water drills.

The straining medium in the filter, illustrated in Fig. 7 consists of a tube of brass wire cloth through which the air must pass to enter the machine. The area through this tube is greatly in excess of the area of the inlet and outlet passages, which insures a free flow of air.—Eng. and Min. Journal.

### PERSONAL AND GENERAL.

Members of the Canadian Mining Institute who attended the International Mining Convention held at Nelson, British Columbia, on May 18 and 19, in connection with which there was held a joint meeting of the Columbia Section of the American Institute of Mining Engineers and the Western Branch of the Canadian Mining Institute, were Mr. Jas. Anderson, Kaslo; Mr. L. K. Armstrong, Spokane, Wash.; Mr. S. G. Blaylock, Trail; Mr. S. S. Fowler, Riondel; Mr. J. Cleveland Haas, Spokane; Mr. E. Jacobs, Victoria; Mr. W. C. E. Koch, Nelson; Mr. Oscar Lachmund, Greenwood; Mr. G. A. Lafferty, Rossland; Mr. A. G. Larson, Spokane; Mr. W. H. Linney, Spokane; Mr. Alfred McMillan, Rossland; Mr. Fred S. Peters, Rossland; Mr. Wm. Thomlinson, New Denver; Mr. John Vallance, New Denver; Mr. H. E. Wade, Trail; Mr. Bruce White, and Mr. Oscar White, Sandon, Slovan.

Mr. M. S. Davys has returned to West Kootenay district of British Columbia from Southern California, much improved in health.

Mr. S. P. Silverman, son of Mr. S. I. Silverman, manager, is superintendent for the Tidewater Copper Co., which is developing the Indian Chief mine, near Sidney Inlet, West Coast of Vancouver Island, B.C.

Mr. James Cronin was down from the Babine region of Omineca mining division of British Columbia last month, to visit his family in Spokane, Wash.

Lieut. C. St. G. Campbell is reported missing since April 6.

Mr. Arthur A. Cole, president of the Canadian Mining Institute, is acting as field organizer for the Central Directing Committee of Volunteer Organizations, entrusted with the task of securing industrial returns for the Advisory Council for Industrial and Scientific Research. The performance of this duty will involve something like 10,000 miles of travelling. Mr. Cole left early in May for British Columbia, and will visit in turn the provinces of Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

Mr. Samuel Cohen, general manager, Crown Reserve Mining Co., Ltd., Porcupine-Crown Mines Limited, has returned to Montreal after a two-months' trip to California.

Mr. Julius M. Cohen, manager Croesus Gold Mines, Limited, Matheson, Ont., has been appointed a first lieutenant in the United States Reserve Corps.



## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA.

At the end of May there was little change in the situation as regards the strike of members of District No. 18, United Mine Workers of America, affecting the operation of coal mines in the Crowsnest district of British Columbia and in Alberta. There has been a deadlock for a while, the miners insisting on a 30 per cent. increase in wages and the operators stating that they will not grant so large an increase, meanwhile maintaining their stand on their stated willingness to grant a 15 per cent. increase.

One press despatch, from Ottawa, is to the effect that the strikers are not inclined to resume work except on their own terms, notwithstanding the efforts of President White of the International organization of the U. M. W. of A. A despatch from Calgary, Alberta, stated that by May 29th another step had been reached in the strike situation, the miners seeming to have gained one point. Following instructions from the International Board that work be resumed on the 15 per cent. increase basis, the various camps in District 18 have notified District President Graham of their intention to insist on their demand for a 30 per cent. increase. The district secretary is quoted as having said: "There is no possibility, as far as we can see at present, of any camp deviating from this line of action, and we are quite satisfied with the conditions. "No communication had by then been received by the representatives of the miners, neither from the operators nor the Dominion Government, and no move was then expected toward a resumption of work in the mines of the central and southern parts of the district.

On the other hand, it is stated that indications of a disposition to meet the demands of the men had come from the Grand Trunk Pacific section, in which are situated the Mountain Park, Pacific, and Yellowhead mines, which are described as large independent collieries. Requests for representatives of the policy committee were made and two representatives had gone to that district, the expectation being that the 30 per cent. increase would be conceded there.

From the Brule Lake region, on the Canadian Northern Railway, where about 800 miners are on strike, no similar intimations had been received up to May 29, and there was uncertainty as to the attitude of the mine operators there. The mines in both the Grand Trunk Pacific and Canadian Northern Railway districts are stated to not be represented in the Western Coal Operators' Association, so they are individually free to make their own settlement with the miners. Vice-President Rees, Canadian representative on the U. M. W. of A. International Council, who had been attending the council meeting in Indianapolis, was expected to arrive in Calgary on May 30, and it was expected he would endeavor to persuade the miners to follow the advice of President White and return to work. The further statement was made that this would be the last effort to reach a settlement of the trouble by agreement, and should it fail the alternative would be for the Government to take charge of the coal mines and operate them under the direction of a Commission.

Meanwhile, there is some improvement in the position in Rossland camp and at Phoenix, for in the former the Consolidated Mining and Smelting Company has employed a number of men to do development work in its mines, and in the White Bear in which it has been doing exploratory work under an option to pur-

chase, while the Granby Consolidated Company has put on forty to fifty men, also to do development work, pending the receipt of coke at the company's smelting works to admit of a return to production and smelting operations.

The effect of the long-continued stoppage of the supply of coke from the Crowsnest region is seen in the considerable decrease that has taken place in the quantity of ore received at the Consolidated Company's smelting works at Trail, West Kootenay. During three weeks ended May 21, the total quantity of ore received was 10,270 tons, as compared with that of the corresponding periods of the four earlier months of the current year, as follows: For three weeks in April, 19,120 tons; in March, 29,342 tons; in February, 30,471 tons, and in January, 23,646 tons. Reduced to daily averages, the average for each day of the three weeks in January was 1,126 tons; in February, 1,451 tons; in March, 1,397 tons; in April, 910 tons, and in May 489 tons. The Granby Company's smelting works at Grand Forks have been inoperative for several weeks, and the Canada Copper Corporation has had to restrict its smelting to using one furnace only, using coke obtained from the United States.

#### East Kootenay.

Production of lead and zinc ore, probably in the largest part of the latter, is being maintained at the Sullivan mine, in Fort Steele mining division. During rather more than six weeks, ended May 21, the total quantity of ore received at Trail from this mine was 17,473 tons. From other mines in the district, only 202 tons was received, of which 126 tons was from the Consolidated Company's St. Eugene mine, and 76 tons from the Paradise mine in Windermere mining division of East Kootenay.

The Victor-Silver Leaf mine, on Maus creek, about eight miles from Fort Steele, is being worked by Spokane men, who are employing ten men doing development work pending the completion of a temporary wagon road to allow of hauling being done between the Kootenay Central Railway and the mine, after which more men will be put on. The expectation is that a production will be made daily of 20 to 40 tons of silver-lead ore of a grade that will average about 100 a ton gross value. Besides the high-grade ore, there is stated to be a large quantity of milling ore, so that if concentrating facilities be provided, there will be concentrate as well as crude ore to ship to the smelting works.

#### West Kootenay.

**Ainsworth.**—The Bluebell, on the east shore of Kootenay Lake, and the Highland, north of the town of Ainsworth, have been the larger shippers to Trail from this division in recent weeks. The most noteworthy feature of late was the starting of the concentrating mill of the Florence Silver Mining Co., after weeks of waiting for sufficient water for power and milling purposes. The installation of concentrating machinery at the Silver Hoard mine, near the town, is reported. Arrangements have been made for resuming work on the Cork-Province property, on the south fork of Kaslo creek. The Utica is stated to be in an improved position financially, with about \$100,000 available for operating purposes.

**Slocan.**—With the snow melting the water supply has considerably increased, so that concentrating mills are no longer hampered as they had been for several months. The changed conditions are making it easier to operate mines and to run concentrating mills to capacity. The Rambler-Cariboo, Slocan Star, and Sur-



prise are being benefited by the passing of winter, production of concentrate being practicable on a larger scale than during the winter. Favorable developments in the Noonday company's Slocan King mine, in close proximity to the Slocan Star, are reported. The Queen Bess continues to do well, with much good ore available for shipment when hauling to the railway shall again be practicable. Lucky Jim affairs are still in a tangle so far as the affairs of the company are concerned, but the receiver, under whom the mine has been operated for some time past, has been gradually accumulating money with which to pay off the unsecured claims that have long been standing against the company. In Silverton camp, progress is being made at the Standard, most of the men employed being at work in the company's Alpha property; the chief output of late has been of zinc ore from levels 6, 7, and 8; a late report is that some more good silver-lead ore has been found on No. 4 level. The Galena Farm mine and concentrating mill are now running and shipment of ore and concentrate to Trail has been resumed.

**Nelson.**—Developments in the Granite-Poorman gold mine are favorable. There is an improved outlook for the Eureka copper mine. The finding of a shoot of good silver-copper ore in one of the Silver King mines has been reported. In the Salmo region there is a change for the better; in the Emerald there is much lead ore opened, and shipments will be made as soon as the wagon road will stand the heavy hauling over it. Sulphide zinc ore has been found on the 300-ft. level of the Hudson Bay mine, from which shipment of carbonate ore is again being made.

**Revelstoke and Lardeau.**—The Lanark, at Illecillewaet, in Revelstoke division, is again on the shipping list, having shipped 41 tons to Trail at the beginning of May. A concentrating plant has been installed on that property. Efforts are being made to revive interest in the lode-mining properties in the Big Bend of the Columbia region. Various properties in Lardeau and Trout Lake divisions are having attention.

#### Boundary.

Mention has already been made of conditions at the respective smelting works of the Granby and British Columbia Copper (now Canada Copper Corporation) smelting works. Now that spring has set in, preparations are being made to again ship ore from the Union mine, in Franklin camp, some 50 miles north of Grand Forks.

#### Similkameen and Nicola.

In Nicola valley, concentration of ore has been commenced at Stump Lake by the Donohue Mines, Ltd. Experiments with Nicola coal, for making a good metallurgical coke and recovery of by-products, are reported to have given promising results.

### COPPER MINING IN YUKON.

Whitehorse, Yukon,—It is reported a body of high grade ore was struck a few days ago in the War Eagle.

Messrs. Wm. Ceinick, John Bonanza and Fred McGlashen, lessees of the Anaconda copper mine, are having hauled into town and will ship some time this week two carloads of ore which has an assay value of 15.40 per cent. copper. Some of the ore will run as high as 40 per cent.

Foreman Nelson of the Valerie copper mine was in

Town Saturday and reported that everything was progressing there in fine shape. The main shaft has been cleared of ice and pumped free of water and all is in readiness for the commencement of the work of taking out ore as soon as some necessary machinery, expected to reach here from the outside almost any day, arrives.

The main shaft of the Copper King mine having reached a depth of 190 feet, Manager J. P. Whitney now finds it necessary to add more machinery to overcome the increased seepage of water. In the past 40 days a 200 foot drift has been run on the Copper King to tap a body of bornite and peacock copper ore located by the diamond drill. The drift has not yet reached this deposit, however, and its extent is therefore still problematical.—Weekly Star.

### MR. GALLOWAY FIRST B. C. DISTRICT ENGINEER.

Victoria, B.C., June 1.—The first of the district engineers to be appointed under the provisions of the Mineral Survey Act of the late session has been named by the Government. Mr. John D. Galloway, assistant mineralogist in the Department of Mines here for some years, a competent mining engineer, and a graduate of McGill, has been appointed engineer for the North-eastern Mineral Survey district which comprises the old mining divisions of Omineca, Peace River, Cariboo and Quesnel, with headquarters at Hazelton.

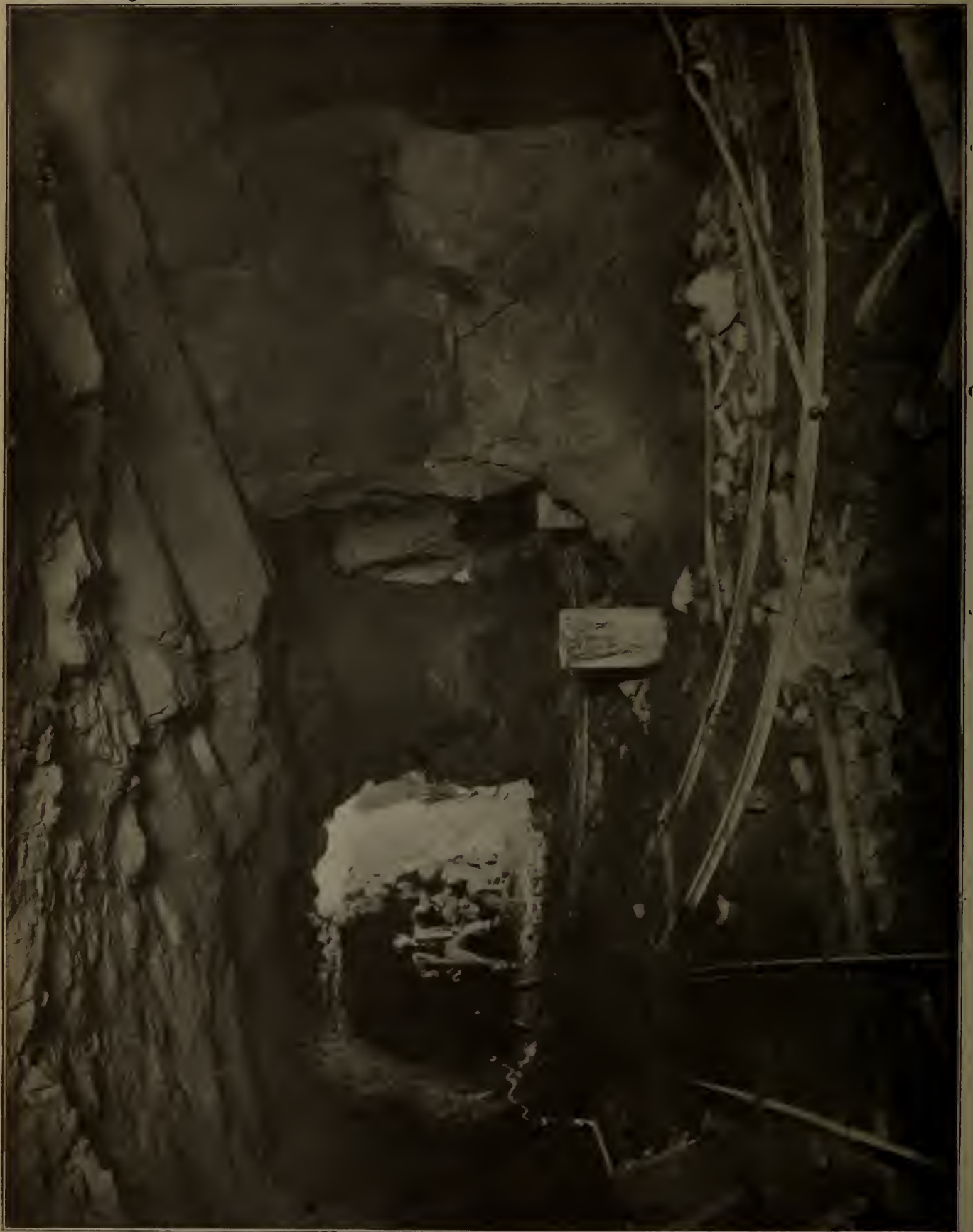
The act divides the Province into six districts, for which appointments will be made, but with the exception of Mr. Galloway there will be no further appointments made for some time, it is stated. A perfect deluge of applications have been sent in by those seeking office.

The position of district engineer will be no sinecure. The act requires him to carry on a continuous mineral survey of his district, keep complete records and plans thereof and submit continuous reports to the department, and generally perform the duties required by the act, assist the prospectors by furnishing them with needed information, examining and testing their samples of ore, report upon the necessity or otherwise and cost of roads, trails, etc., and direct drilling operations under the Government's plan of testing mineral properties, etc.

Hon. Mr. Sloan, Minister of Mines, stated yesterday that he considered the department fortunate in being able to secure the services of a man so eminently qualified to fill the position as Mr. Galloway.—The Colonist.

### EXPLOSION AT CUMBERLAND MINE.

Nanaimo, B. C., June 4.—Four men were killed instantly and much damage done to No. 6 mine of the Canadian Collieries, Dunsmuir, Ltd., at Cumberland by a terrific explosion Sunday. The four victims comprised members of a survey party headed by George N. Bertram, Chief Surveyor of the collieries, who, as is the usual custom, mapped out on Sundays, when the full shift was not working, such extensions and new work as were contemplated during the week. The party consisted of George N. Bertram; Lewis Murdock, Assistant Surveyor; Frank Bobbo, fire boss, and A. Brown of Nanaimo, a miner. So far the cause of the explosion remains a mystery. About fourteen years ago there was an explosion in the same mine, when about sixty were killed. Since then, however, the mine has been considered safe by miners. It is located under the very heart of Cumberland, and the town was badly rocked by the force of the explosion.



Underground in a Cobalt Silver Mine.



## MARKETS

## SILVER PRICES.

|             | New York.<br>cents. | London.<br>pence. |
|-------------|---------------------|-------------------|
| May 25..... | 74 $\frac{5}{8}$    | 37 $\frac{7}{8}$  |
| " 26.....   | 74 $\frac{5}{8}$    | 37 $\frac{7}{8}$  |
| " 28.....   | 74 $\frac{5}{8}$    | ....              |
| " 29.....   | 74 $\frac{5}{8}$    | 37 $\frac{7}{8}$  |
| June 1..... | 74 $\frac{5}{8}$    | 38                |
| " 4.....    | 75 $\frac{1}{4}$    | 38 $\frac{3}{4}$  |
| " 6.....    | 75 $\frac{1}{8}$    | 38 $\frac{1}{8}$  |

## TORONTO MARKETS.

|                                                                    |
|--------------------------------------------------------------------|
| Cobalt oxide, black, \$1.50 per lb.                                |
| Cobalt oxide, grey, \$1.65 per lb.                                 |
| Cobalt metal, \$2.25 per lb.                                       |
| Nickel metal, 45 to 50 cents per lb.                               |
| White arsenic 15 cents per lb.                                     |
| June 8, 1917—(Quotations from Canada Metal Co., Toronto)           |
| Spelter, 12 $\frac{1}{2}$ cents per lb.                            |
| Lead, 14 cents per lb.                                             |
| Tin, 67 cents per lb.                                              |
| Antimony, 26 cents per lb.                                         |
| Copper, casting, 34 cents per lb.                                  |
| Electrolytic, 36 cents per lb.                                     |
| Ingot brass, yellow, 23 cents; red, 25 $\frac{1}{2}$ cents per lb. |
| June 8, 1917—(Quotations from Elias Rogers Co., Toronto)           |
| Coal, anthracite, \$9.50 per ton.                                  |
| Coal, bituminous, nominal, \$9.00.                                 |

## NEW YORK MARKETS.

|                                                                |
|----------------------------------------------------------------|
| Connellsville Coke—                                            |
| Furnace, spot, \$9.50 to \$9.75.                               |
| Furnace, contract, \$8.50.                                     |
| Foundry, spot, \$10.00 to \$11.00.                             |
| Foundry, contract, \$9.50 to \$10.50.                          |
| Straits Tin, spot, f.o.b. nominal, 61.00 cents.                |
| Copper—                                                        |
| Prime Lake, nominal, 31.00 to 32.00 cents.                     |
| Electrolytic, nominal, 32.50 to 33.00 cents.                   |
| Casting, nominal, 30.50 to 31.00 cents.                        |
| Lead, Trust price, 10.00 cents.                                |
| Lead, outside, nominal, 11.50 cents.                           |
| Spelter, prompt western shipment, 9.55 to 9.67 $\frac{1}{2}$ . |
| Antimony—                                                      |
| Chinese and Japanese, nominal, 21.00 to 21.50 cents.           |
| Aluminum—nominal.                                              |
| No. 1 Virgin, 98-99 per cent., 59.00 to 61.00 cents.           |
| Pure, 98-99 per cent. remelt, 56.00 to 58.00 cents.            |
| No. 12 alloy remelt, 41.00 to 43.00 cents.                     |
| Powdered aluminum, 85.00 to 90.00 cents.                       |
| Metallic magnesium—99 per cent. plus, \$2.50 to \$3.00.        |
| Nickel—Shot and ingot, 50.00 cents.                            |
| Electrolytic, 55.00 cents.                                     |
| Cadmium, nominal, \$1.45 to \$1.50.                            |
| Quicksilver, \$90.00.                                          |
| Platinum—                                                      |
| Pure, \$105.00.                                                |
| 10 per cent. iridium, \$110.00.                                |
| Cobalt (metallic), \$1.70.                                     |
| Tungsten, per unit—                                            |
| Sheelite, \$17.50.                                             |
| Wolframite, \$17.00.                                           |
| Silver (official), 75 $\frac{1}{4}$ cents.                     |

## COBALT AND PORCUPINE STOCKS.

As of June 11th, 1917.

|                          | Gold.             | Asked.            | Bid. |
|--------------------------|-------------------|-------------------|------|
| Apex .....               | .04 $\frac{1}{2}$ | .04 $\frac{1}{8}$ |      |
| Boston Creek .....       | ...               | .62               |      |
| Davidson .....           | .75               | .60               |      |
| Dome Extension .....     | .14               | .12 $\frac{1}{2}$ |      |
| Dome Lake .....          | .17               | ...               |      |
| Dome Mines .....         | 10.00             | 9.75              |      |
| Eldorado.....            | .02               | ...               |      |
| Elliott .....            | .35               | .33               |      |
| Gold Reef .....          | .02               | .01               |      |
| Hollinger Con. ....      | 3.55              | 3.50              |      |
| Inspiration .....        | .06               | ...               |      |
| Keora .....              | .12 $\frac{1}{2}$ | .10               |      |
| Kirkland Lake .....      | ...               | .36               |      |
| McIntyre .....           | 1.37              | 1.35              |      |
| Moneta .....             | .11               | ...               |      |
| Newray Mines .....       | ...               | .63               |      |
| Pearl Lake .....         | .00 $\frac{1}{4}$ | ...               |      |
| Porcupine Bonanza .....  | .09               | ...               |      |
| Porcupine Crown .....    | .54               | ...               |      |
| Porcupine Gold .....     | .02               | ...               |      |
| Porcupine Imperial ..... | .02 $\frac{1}{4}$ | .02               |      |
| Porcupine Tisdale .....  | .01 $\frac{3}{4}$ | .01 $\frac{1}{2}$ |      |
| Porcupine Vipond .....   | .34 $\frac{1}{2}$ | .33               |      |
| Preston .....            | .04               | .03               |      |
| Schumacher G. M. ....    | .48               | ...               |      |
| Teck Hughes .....        | .56               | .50               |      |
| Thompson Krist .....     | .09               | .08               |      |
| T. Burns, com. ....      | ...               | .17 $\frac{1}{2}$ |      |
| West Dome Con. ....      | .18               | .17 $\frac{3}{4}$ |      |

## Silver.

|                        | Asked.            | Bid.              |
|------------------------|-------------------|-------------------|
| Ananac .....           | .20               | ...               |
| Bailey .....           | .04               | .03               |
| Beaver .....           | .33               | .30 $\frac{3}{4}$ |
| Buffalo .....          | 1.40              | 1.00              |
| Chambers-Ferland ..... | .11               | .10 $\frac{1}{2}$ |
| Coniagas .....         | 4.50              | 3.75              |
| Crown Reserve .....    | .28               | .25 $\frac{1}{2}$ |
| Gifford .....          | .03 $\frac{3}{8}$ | .03 $\frac{1}{2}$ |
| Gould Con. ....        | .00 $\frac{3}{8}$ | ...               |
| Great Northern .....   | .08 $\frac{3}{4}$ | .08               |
| Hargraves .....        | .11 $\frac{3}{4}$ | .11 $\frac{1}{2}$ |
| Hudson Bay .....       | 40.00             | ...               |
| Kenabeek .....         | .28               | .27               |
| Kerr Lake .....        | 4.70              | 4.55              |
| Lorrain .....          | .18               | ...               |
| La Rose .....          | .45               | .41               |
| McKin. Darragh .....   | .52               | .51               |
| Nipissing .....        | 7.50              | 7.40              |
| Ophir.....             | .05 $\frac{1}{4}$ | .05               |
| Peterson Lake .....    | .09 $\frac{1}{2}$ | .08 $\frac{3}{4}$ |
| Right of Way .....     | .06               | .05               |
| Shamrock .....         | .18               | ...               |
| Silver Leaf .....      | .02               | .01 $\frac{1}{4}$ |
| Seneca Superior .....  | .02 $\frac{1}{2}$ | .02               |
| Temiskaming .....      | .37               | .36               |
| Trethewey .....        | ...               | .11               |
| White Reserve .....    | ...               | .10               |
| Wettlaufer .....       | ...               | .05               |
| York, Ont. ....        | .02               | ...               |

**SMELTER SMOKE CASES.**

Toronto, May 31.—In a written judgment of 180 pages Mr. Justice Middleton gave judgment this afternoon against the Mond Nickel Company in two cases, and against the Canadian Copper Company in four damages for the sulphur fumes from the smelters in Sudbury district.

Other actions had been begun, but remained in abeyance, pending the trial of the six charged decided upon to-day.

An interesting exhibit at the trial was a letter from Lord Kitchener as to the importance of nickel in the war.

To-day's awards were: Andrew Ostrosky and Justine Ostrosky, \$500; and J. H. Clary, \$1,000—against Mond Nickel co.

J. F. Black, \$1,000; Maria Taillefer, \$8000; Joseph Belanger, \$750; and Sudbury & Copper Cliff Dairy Co., \$1,000. against Canadian Copper Co.

**A BILLION IN BULLION.**

In the House at Ottawa last week Sir Thomas White stated that the amount of gold in coin and bars handled by the Canadian finance department since the war was twice the total amount of gold that there was in England when the war began, and this vast supply had come to Canada from Great Britain, Asia, Russia, Africa and other countries, via Halifax and Vancouver. The bullion shipments had been made in British warships coming to Halifax or Vancouver, where they were met by officials of his department and taken to Ottawa.

Since the beginning of the war, said Sir Thomas, the Canadian finance department had handled for the Imperial government and the Bank of England \$1,000,000,000 in bullion. In addition to this, the Mint had been enlarged to refine gold coming from South Africa and Russia.

**LARGE COPPER PRODUCTION.**

Boston, June 6.—In the first four months of this year the principal copper mines of North and South America produced a total approximating 715,000,000 pounds. The come-back from the winter curtailment has been quite marked all along the line, and with no interference to the mining operations as a whole the current year should be able to hang out another high record in the matter of production.

Of the 715,000,000 pounds produced to date in 1917 Anaconda was responsible for nearly 114,000,000 pounds, with Phelps-Dodge Corporation properties second with a total of 64,000,000 pounds.

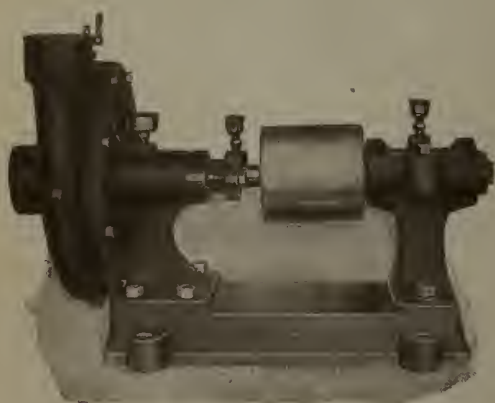
**WESTERN BRANCH C. M. I.**

A business meeting of members of the western branch of the Canadian Mining Institute was held at Nelson on Friday, May 18th, with Bruce White, chairman of the branch, in the chair.

Scrutineers reported the election of W. M. Brewer of Victoria, mining engineer, as chairman of the branch for the ensuing year and of the following members of council to represent the various parts of the province: Cariboo, John Hopp, Barkerville; Crowsnest, Chas. Grhaam, Michel; East Kootenay, J. H. Cram, Kimberley; Nelson, A. G. Larson; Trail, E. H. Hamilton; Boundary, C. M. Campbell, Phoenix; Similameen, F. S. Norcross, Jr., Copper Mountain; Nicola and Yale, Frederic Kefffer, Highland Valley; Kamloops, W. F. Wood; mainland coast, F. M. Sylvester, Vancouver; Omineca, J. H. McMillan, Prince Rupert; Victoria, Wm. Fleet Robertson. Other members of the branch council, ex officio, are Messrs. E. E. Campbell, Anyox; S. S. Fowler, Riondell; Thos. Graham, Cumberland; G. P. Jones, Hedley; M. E. Purcell, Rossland, and Bruce White, Sandon, Slocan.

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TEN per cent. of the amount of the purchase price is to be paid at the time of sale, the balance within thirty days thereafter.

In all other respects the terms and conditions of sale will be the standing conditions of the Supreme Court of Ontario.

Further particulars can be had from STEWART, HOPE & O'DONNELL, of Perth, Ontario, Solicitors for the Vendor, and J. L. Whiting, Esq., K.C., Kingston.

(Sgd.) J. B. WALKEM,

37—3t.

Master.

Dated at Kingston this 10th day of May, A.D. 1917



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